

BIENNIAL REPORT
DEPARTMENT OF AGRICULTURE



NORTH CAROLINA

1918 - 1920

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BIENNIAL REPORT

of the

NORTH CAROLINA
DEPARTMENT
of
AGRICULTURE

From December 1, 1918
To December 30, 1920

RALEIGH
EDWARDS & BROUGHTON PRINTING CO.
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1920



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* In coöperation with U. S. Department of Agriculture, Bureau of Markets.

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BIENNIAL REPORT

OF THE

NORTH CAROLINA DEPARTMENT OF AGRICULTURE

RALEIGH, N. C., November 30, 1920.

His Excellency, GOVERNOR BICKETT,

DEAR SIR:

In accordance with section 3, chapter 876, Laws 1907, I submit my report of the operations of the Department of Agriculture for the past year which you will please transmit to the General Assembly with such remarks as may seem advisable to you.

The year 1920 completes a census period of ten years. The report contains a comparison of the agricultural condition of the State in 1910 as shown by the census of that year and of this year.

The advance of the State is remarkable and, but for the low prices of our principal crops, the State would have easily ranked second in value of all crops. The United States figures are *estimated*. If our cotton and tobacco excels the estimate figure sufficiently, the State may reach third if not second place when the result for the year is reported.

The farmers have very largely adopted the recommendation of the board that the most important item to the farmer was production of sufficient rations for the support of his farm. This year the State has produced this and it is much more important than the reduction of acreage of cotton and tobacco.

The action of the authorities who control our finances does not seem to be favorable to the producers. The good work which Mr. McAdoo inaugurated gave us a time of unequaled prosperity. The farmer will never see prices maintained until the Federal Government arranges for him to use his crops so as to receive cash advance on them as a basis. When the crops of the State, worth two billion dollars or more, come into market there must be an increase in currency to handle them, or arrangements made to obtain money so that the farmer will not be compelled to sell at less than cost of production. If he is compelled to follow this course long, bankruptcy and poverty cannot be avoided. The same amount of food which supplies one man is not sufficient when twenty are to be fed.

The year now closing was not regarded as particularly favorable to the farmers, yet about as large crops as were ever harvested in the State rewarded the farmer's labors and, in most of the crops, the largest yield in the history of the State will be recorded. Notwithstanding the great decrease in the price of our principal crops, cotton, corn and tobacco, we still hold the sixth place in rank as to value of crops, and would be in second place if the price of the crops had been equal to that of last year. The result at the end of the year may overcome this. North Carolina's cotton and tobacco crops nearly always exceed the estimate of December first. In 1919 there was \$100,000,000 to the State's credit above the estimate of December first. This year completes another census period and the great advance which the State has made in agricultural matters during these ten years is remarkable.

FAIRS

More fairs have been held than in any year prior to this. The exhibit at the State Fair was the best that the State has ever made, and the department's contribution to this was remarkable and attracted much attention. The Fair Association has provided more favorable quarters for next year. The want of funds is the cause of delay in this matter.

The home demonstration work is as much a part of the work of the department as any other branch with which we are connected. Directions have been given to have markers placed in the building showing that it is a part of the work of the Department of Agriculture, and one placed over the door of the entrance to the building. I doubt if there is not more accomplished by this work for the benefit of the farmers and their wives than by any other branch of the department.

The board gives a thousand dollars each year to aid in the exhibitions of the other departments at the fair. It would be but just if there should be appropriated \$400 to aid the home demonstration work in its exhibit and payment of premiums, the same to be appropriated to Mrs. Jane McKimmon, superintendent of this work, and distributed in the premiums as she might approve. If the State Fair Association could allot more space to the exhibit of the board, we could add many items in this department.

COMMUNITY FAIRS

The department now pays the expenses of the judges at these fairs. I do not approve of the continuance of this policy. I think each fair should pay those employed by it.

The board resolved to pay no premiums at fairs where admission was charged.

FAIRS HELD IN 1920

White

State	1
Special	4
District	8
County	34
Community	161

Negro

State	1
County	9
Community	28

Most of the board have been members through the census period which is now closing and a reference to the statistics, which are incorporated, shows the wonderful advance agriculture has made under their administration.

In rank of the states, North Carolina stands

- First In production of cotton per acre
 In value of tobacco crops
 In production of soy beans
 In development of home economics, especially woman's work.
- Second In amount of cotton goods manufactured
 In value of farm crops per acre
 In value of farm crops per capita
 In production of sorghum
- Third In production of sweet potatoes
 In production of peanuts
 In production of buckwheat
- Sixth In value of all crops
- Sixth In amount of money paid into United States Treasury
 In earnings of individuals

North Carolina's rank in 1920 in different crops:

Corn	18
Irish Potatoes	24
Tobacco	1
Apples	12
Oats	18
Hay	29
Wheat	16

CROPS TO JANUARY 1, 1921

The United States Bureau of Crop Estimates has published the following estimate of the value of all crops of the respective states for this year:

RANK OF STATES BY TOTAL CROP VALUES

1st.	Texas	\$727,400,000
2nd.	Iowa	459,191,000
3rd.	Illinois	459,179,000
4th.	California	457,750,000
5th.	New York	456,507,000
6th.	North Carolina	412,374,000
7th.	Pennsylvania	397,617,000
8th.	Kansas	378,436,000
9th.	Ohio	369,869,000
10th.	Wisconsin	360,270,000
11th.	Missouri	343,012,000
12th.	Georgia	323,290,000
13th.	Nebraska	306,469,000
14th.	Michigan	303,410,000
15th.	Indiana	299,751,000
16th.	Oklahoma	294,715,000

This is adopted by the United States Departments and no credit is given for values of increases reported for the months after this.

This is the value of the crops as estimated by the U. S. Department of Agriculture. North Carolina's year closes August 1st with tobacco sales. She will get credit for any cotton and tobacco produced amounting to more than the official estimates.

North Carolina's rank in particular crops this year and production:

Corn	64,032,000 bus.	19.
Wheat	8,471,000 bus.	23.
Oats	3,960,000 bus.	33.
Rye	912,000 bus.	16.
Tobacco	284,122,000 lbs.	2.
Peanuts	3,955,000 bus.	5.
Potatoes	5,040,000 bus.	26.
Sweet potatoes	10,605,000 bus.	4.
Cotton	840,000 bales	7.
Buckwheat	210,000 bus.	11.
Sorghum	3,700,000 gals.	6.
Hay	1,310,000 tons	26.
Soybeans	1,638,000 bus.	1.
Cowpeas	2,343,000 bus.	3.

All crops 7,082,400 acres—20th among states.

North Carolina has risen from the 22 state as to value of crops in 1910 to the sixth place, as the figures show.

Reports of the U. S. Agricultural Department Bureau of Crop Estimates, December, 1919, showing rank of states for all crops, and value of crops:

<i>Rank</i>	<i>States</i>	<i>Value Per Acre</i>	<i>Farmer Acres</i>	<i>Main Crops</i>
1.	Massachusetts	\$115.15	616,000	Truck-Tobacco
2	Connecticut	102.00	528,000	Truck-Tobacco
3.	Rhode Island	96.00	66,000	Truck
4.	New Jersey	87.70	1,116,000	Truck
5.	Arizona	81.20	559,000	Cotton-Truck
6.	California	78.60	5,920,000	Fruit & Truck
7.	Florida	62.90	1,378,000	Fruit & Truck
8.	New Hampshire	56.65	531,000	Fruit & Truck
9.	Maine	56.40	1,505,000	Fruit & Truck
10.	New York	53.00	8,296,000	General Farming
11.	North Carolina	54.75	7,534,000	General Farming

Note: New York and North Carolina are the only strictly Agricultural states in area and number of crops grown with California next.

North Carolina's rank in particular crops this year, and total production:

This estimate is made on the value of 22 crops. Heretofore the estimate has been made on 13 crops.

* Corn	* Lint cotton
* Wheat	* Beans
* Oats	Broom corn
Barley	Grain sorghums
* Rye	Hops
* Buckwheat	Oranges
Flaxseed	* Clover seed
Rice	* Peanuts
* White and sweet potatoes	Cranberries
* All hay	* Apples
* Tobacco	

* The crops so marked are grown to a commercial extent in North Carolina.

NUMBER OF FARMS BY COUNTIES, 1900-1920

County	1920	1910	1900	County	1920	1910	1900
State total.....	269,740	253,725	224,637	State total.....	269,740	253,725	224,637
Alamance.....	2,705	2,508	2,296	Johnston.....	7,026	6,022	4,452
Alexander.....	1,921	1,924	1,580	Jones.....	1,541	1,367	1,226
Alleghany.....	1,409	1,466	1,367	Lee [¶]	1,465	1,272	-----
Anson.....	3,706	3,332	2,940	Lenoir.....	3,162	2,423	2,179
Ashe.....	3,407	3,215	3,099	Lincoln.....	2,063	2,244	1,866
Avery*.....	1,315	-----	-----	McDowell.....	1,435	1,624	1,827
Beaufort.....	3,228	2,951	2,431	Macon.....	1,925	1,944	1,888
Bertie.....	3,340	3,183	2,663	Madison.....	2,935	3,273	3,382
Bladen.....	2,452	2,495	2,488	Martin.....	2,515	2,134	1,689
Brunswick†.....	1,417	1,666	1,373	Mecklenburg.....	4,344	4,439	4,190
Buncombe.....	3,701	4,145	4,140	Mitchell†.....	1,543	2,486	2,287
Burke.....	2,190	2,569	2,222	Montgomery.....	1,657	1,671	1,564
Cabarrus.....	2,427	2,374	2,045	Moore†.....	2,176	1,825	2,773
Caldwell†.....	1,972	2,548	2,203	Nash.....	4,451	4,194	3,237
Camden.....	875	821	858	New Hanover†.....	323	420	379
Carteret.....	837	982	754	Northampton.....	3,501	3,441	2,837
Caswell.....	2,558	2,002	1,745	Onslow†.....	2,179	2,061	1,632
Catawba.....	2,916	3,199	2,647	Orange.....	2,183	1,967	2,044
Chatham†.....	3,741	3,646	3,605	Pamlico.....	1,316	1,082	813
Cherokee.....	1,903	1,912	1,731	Pasquotank.....	1,360	1,264	1,125
Chowan.....	1,028	983	833	Pender†.....	1,886	1,983	1,975
Clay.....	808	762	817	Perquimans.....	1,462	1,319	1,257
Cleveland†.....	4,016	4,032	3,446	Person.....	2,787	2,365	1,971
Columbus.....	3,580	3,394	2,861	Pitt.....	5,937	4,696	4,022
Craven.....	2,598	2,098	1,725	Polk.....	1,200	1,166	1,048
Cumberland†.....	3,100	3,463	2,673	Randolph.....	3,871	4,011	3,739
Currituck.....	984	932	912	Richmond.....	1,797	1,621	1,462
Dare.....	77	136	229	Robeson.....	6,564	6,450	4,848
Davidson.....	3,770	3,505	3,419	Rockingham.....	3,664	3,189	3,196
Davie.....	1,769	1,794	1,742	Rowan.....	3,474	3,241	3,082
Duplin†.....	4,686	3,847	3,303	Rutherford.....	3,625	3,447	3,365
Durham†.....	1,769	1,616	1,548	Sampson.....	5,771	4,577	3,783
Edgecombe.....	3,840	2,929	2,284	Scotland.....	1,830	1,489	1,080
Forsyth.....	2,849	2,647	2,421	Stanly.....	2,519	2,445	1,983
Franklin.....	4,226	3,567	3,367	Stokes.....	3,372	3,357	3,234
Gaston†.....	2,339	2,859	2,213	Surry.....	4,065	4,187	3,523
Gates.....	1,583	1,439	1,461	Swain.....	1,264	1,383	1,225
Graham.....	746	770	732	Transylvania.....	799	892	1,008
Granville.....	3,503	3,259	3,135	Tyrrell.....	643	698	657
Greene.....	2,740	2,193	2,071	Union.....	4,820	4,856	3,793
Guilford.....	4,021	3,776	3,497	Vance.....	2,036	2,021	1,680
Halifax.....	4,671	4,295	3,489	Wake†.....	6,804	6,137	5,188
Harnett†.....	3,378	2,710	2,316	Warren.....	3,169	2,720	2,616
Haywood.....	2,074	2,125	2,349	Washington.....	1,110	975	970
Henderson.....	1,972	2,169	1,853	Watauga†.....	2,020	2,332	2,170
Hertford.....	2,084	2,258	1,788	Wayne.....	5,030	4,035	3,291
Hoke*.....	1,495	-----	-----	Wilkes.....	4,971	5,233	4,387
Hyde.....	1,149	1,341	1,061	Wilson.....	4,439	3,406	2,565
Iredell.....	4,115	3,967	3,897	Yadkin.....	2,647	2,476	2,242
Jackson.....	1,852	1,897	1,935	Yancey.....	2,222	2,164	2,023

*New county formed between 1910 and 1920.

†Figures not strictly comparable by reason of change in county boundary between 1910 and 1920.

‡Figures not strictly comparable by reason of change in county boundary between 1900 and 1910.

¶New county formed between 1900 and 1910.

SUMMARY ESTIMATES FOR 1920 CROPS, TOGETHER WITH 1910 SUMMARY
(1920 Figures Preliminary Basis November 17th)

Crops	Acres		Yield Per Acre		Production		Value 1920		Value 1910	
	1920	1910	1920	1910	1920	1910	Per Unit	Total	Per Unit	Total
Apples, total, tree*	3,200,000	4,910,171	3	.97	9,600,000	4,775,693	\$.82	\$ *7,872,000	\$.93	\$ 4,441,401
Beans, dry, edible	5,200	5,521	7.6	6.5	40,000	35,937	4.60	184,000	2.26	81,217
Buckwheat	10,400	5,000	21	19	218,000	95,000	1.30	283,400	.80	76,000
Clover seed	11,000		3.1		34,000		17.00	578,000		
Clover hay†	190,000		1.4		361,000		27.00	17,182,000		
Corn	2,784,000	3,072,000	22.5	18.6	62,640,000	57,139,000	1.46	91,454,400	.76	43,426,000
Corn fodder, leaves	2,601,000		.23		598,230		30.00	17,946,900		
Corn stover	68,000		1.6		108,800		10.00	1,088,000		
Cotton planted	1,530,000									
Cotton harvested, lint	1,500,000	1,487,000	260	227	390,700,000	337,500,000	.17	66,419,000	.141	47,587,500
Cotton harvested, seed	1,500,000		526		789,000,000		.013	10,257,000		
Cowpeas, threshed	202,400		7.6		1,538,000		2.60	3,998,800		
Cowpeas, hay†	178,000		1.5		267,000		30.00	18,010,000		
Forage and soiling, green (oats, rye, peas, beans)	170,000		3		510,000		10.00	5,100,000		
Fruit not listed elsewhere*								*1,000,000		
Grain sorghums	400		16		6,400		2.00	12,800		
Grapes, vines*	1,294,117	411,278	1.7		2,200,000	15,116,920	2.50	*5,500,000		
Hay, tame, all†	897,000	175,000	1.4†	1.5	1,235,000	262,000	26.40	33,926,000		3,825,000
Hay, (alfalfa, vetch, timothy, crab-grass and mixtures)†	201,000		1.6		321,630		28.00	9,004,800		
Hay, wild	21,000		1.1		23,000		17.00	391,000		
Maple sugar and syrup (as sugar)	260		160		42,000		.40	16,800		
Oats, grain	180,452	190,000	22	18.2	3,970,000	3,458,000	1.05	4,168,500	.60	2,075,000
Oats, hay†	103,000		1.4	1.5	144,200		22.00	3,172,400		
Peaches, total, tree*		2,661,791			1,909,000	1,344,410	1.81	*3,455,290		
Peanuts, nuts	122,760	195,134	35		4,297,000	5,980,919	1.68	7,218,960	.94	5,622,065
Peanuts, hay†	130,000		1.2		156,000		20.00	*3,120,000		
Pears, total, tree		243,367			184,000	84,019	1.49	*274,160	1.09	91,560
Peas, dry, edible	400	169,934	7	4	3,000	651,567	4.00	12,000		
Potatoes, Irish	56,000	26,000	92	8.9	5,050,000	2,314,000	1.64	8,282,000	.73	1,689,000

SUMMARY ESTIMATES FOR 1920 CROPS, TOGETHER WITH 1910 SUMMARY—Continued

Crops	Acres		Yield Per Acre		Production		Value 1920		Value 1910	
	1920	1910	1920	1910	1920	1910	Per Unit	Total	Per Unit	Total
Rice.....	280	1,000	22	26.5	6,160	27,000	\$ 2.50	\$ 15,400	\$.75	\$ 20,000
Rye, grain.....	96,000	15,000	9.5	10	913,000	150,000	1.85	1,689,050	1.01	152,000
Rye, hay†.....	31,000	—	.8	—	24,800	—	15.00	432,000	—	—
Sorghum, syrup.....	37,200	21,227	100	51.8	3,720,000	1,099,346	1.00	3,720,000	—	—
Soybeans, threshed.....	91,000	—	17	—	1,549,000	—	3.50	5,421,500	—	—
Soybeans, hay†.....	61,000	—	1.6	—	97,600	—	30.00	2,928,000	—	—
Straw, threshed grain.....	1,001,000	—	.7	—	700,700	—	15.00	10,510,500	—	—
Sugar cane syrup.....	1,500	294	121	74	181,500	21,677	1.25	226,875	—	—
Sugar beets.....	200	—	5	—	1,000	—	12.00	12,000	—	—
Sweet potatoes.....	101,000	84,740	107	10.5	10,807,000	8,493,283	1.35	14,589,450	.59	5,011,047
Tobacco.....	581,700	216,000	660	60.0	383,922,000	129,600,000	.27	103,658,940	.106	13,737,600
Velvet beans, threshed.....	4,300	—	19	—	82,000	—	3.00	246,000	—	—
Velvet beans, forage†.....	3,000	—	1.9	—	5,700	—	24.00	136,800	—	—
Winter wheat, planted.....	739,000	—	—	—	—	—	—	—	—	—
Winter wheat, harvested.....	724,000	652,000	11.6	11.4	8,398,000	7,433,000	2.24	18,811,520	1.10	8,176,000
SPECIAL TRUCK CROPS										
Lettuce.....	25	—	—	—	—	—	—	—	—	—
Strawberries.....	9,450	5,450	—	—	—	—	500.00	12,000	—	—
Canadian peas.....	300	—	—	—	—	10,313,361	600.00	5,670,000	—	—
Truck corn.....	4,000	—	—	—	—	—	200.00	60,000	—	—
Cowpeas, green.....	—	—	—	—	100,000	—	60.00	240,000	—	—
Beans, green.....	3,000	—	—	—	—	—	6.00	600,000	—	—
Melons.....	20,000	—	—	—	—	—	150.00	450,000	—	—
Home gardens.....	60,000	—	—	—	—	—	100.00	2,000,000	—	—
Tomatoes.....	3,100	—	—	—	—	—	350.00	21,000,000	—	—
Onions.....	1,900	—	—	—	—	—	230.00	713,000	—	—
Cabbage.....	3,300	—	—	—	—	—	250.00	475,000	—	—
Asparagus.....	100	—	—	—	33,000,000	—	.02	660,000	—	—
							150.00	15,000	—	—

Dewberries.....	1,000	1,233	-----	-----	2,464,065	Acres	240.00	225,000	
Turnips.....	1,200	-----	-----	-----	-----	Acres	75.00	90,000	
Other vegetables.....	1,300	-----	-----	-----	-----	Acres	125.00	162,000	
Principal crops.....	-----	-----	-----	-----	-----	-----	-----	\$343,297,660	\$125,775,147
Other crops.....	-----	-----	-----	-----	-----	-----	-----	66,941,135	
Fruit.....	-----	-----	-----	-----	-----	-----	-----	18,101,450	
Treek.....	-----	-----	-----	-----	-----	-----	-----	32,372,000	
Total value.....	-----	-----	-----	-----	-----	-----	-----	\$460,712,245	

*Crops so marked included in Fruit total.

†Crops so marked included in Hay total marked †.

‡This includes all Hay crops marked ‡.

Principal Crops—North Carolina raises eleven of the thirteen official principal crops of the nation.

LIVESTOCK LISTED FOR TAXES AND ESTIMATED

	1910		1920	
	Number	Value	Number	Value
Horses.....	218,651	\$14,865,000	183,000	\$27,999,000
Mules.....	223,706	19,159,500	236,000	44,840,000
Cattle.....	664,369	10,161,926	722,000	39,492,000
Hogs.....	1,135,797	3,255,222	1,592,000	31,840,000
Sheep.....	123,356	185,986	144,000	1,368,000
Dogs (estimated).....	31,355	93,590	90,000	450,000
Goats.....	26,842	23,952	24,700	99,000

YIELD OF COTTON PER ACRE BY STATES

	1917	1918	1919	1920
Virginia.....	180	269	250	206
North Carolina.....	194	266	266	260
South Carolina.....	208	214	243	256
Georgia.....	173	177	156	138
Florida.....	100	98	70	69
Alabama.....	125	164	130	112
Mississippi.....	155	189	154	147
Louisiana.....	210	143	94	121
Texas.....	135	114	125	178
Arkansas.....	170	148	155	191
Tennessee.....	130	168	184	189
Missouri.....	190	232	260	280
Oklahoma.....	165	91	190	220
California.....	242	418	292	260
Arizona.....	285	263	310	219

COTTON PRODUCTION IN NORTH CAROLINA PER ACRE

210 pounds @ 9.0 cents.....	1908.
219 pounds @ 13.9 cents.....	1909.
212 pounds @ 14.1 cents.....	1910.
315 pounds @ 13.2 cents.....	1911.
267 pounds @ 12.2 cents.....	1912.
239 pounds @ 12.6 cents.....	1913.
290 pounds @ 6.9 cents.....	1914.
260 pounds @ 11.3 cents.....	1915.
215 pounds @ 19.4 cents.....	1916.
187 pounds @ 27.7 cents.....	1917.
264 pounds @ 26.0 cents.....	1918.
266 pounds @ 36.0 cents.....	1919.
260 pounds @ 16.0 cents.....	1920.

PRODUCTION PER ACRE

	Bushels	
	1920	1910
Corn.....	23.0	18.6
Wheat.....	11.6	11.4
Oats.....	22.0	18.2
Rye.....	9.5	10.0
Potatoes.....	92.0	89.0
Potatoes, sweet.....	107.0	105.0
Tobacco.....	66.0	600.0
Peanuts.....	36.0	31.0
Hay.....	1.5	.15

NOTES ON REPORTS OF THE DIFFERENT DIVISIONS

ANALYTICAL DIVISION

The board, at its recent session, adopted the following resolutions:

That there be two groupings of the chemical work in the department in subject matter along the same lines as at present.

(1) Food, oil and the other subjects now handled in this group, to be designated Food and Oil Division, with a head in charge of the work of this group who will be directly responsible to the commissioner and the board.

The chemist in charge of this work shall be known as the State Food Chemist.

(2) Fertilizers, feeds soils and the general agricultural chemical subjects covered in Chapter 83, Article 1, section 19, of part 4 of the Consolidated Statutes of 1919, to be designated Division of Fertilizer and Agricultural Chemistry, with a head in charge of the handling of these subjects who will be directly responsible to the commissioner and the board.

The chemist in charge of this work shall be known as State Agricultural Chemist.

Mr. W. M. Allen was appointed State Food and Oil Chemist.

Work in this division as submitted has been followed. Borax in Fertilizers, a bulletin for October, 1920, has been published, giving information on borax and fertilizers. Monthly bulletins containing analyses of fertilizers have also been published.

A list of analyses for the past two years is submitted:

Official samples of fertilizers.....	2,550
Fertilizers and fertilizer materials for farmers.....	850
Cotton seed meal.....	575
Limes, Limestones and Marls.....	200
Concentrated Stock Feeds.....	1,375
Soils	500
Mineral Waters.....	60
Poison Cases (Animals).....	15
Miscellaneous	50
Total	6,175

REPORT OF DIRECTOR OF EXPERIMENTAL AND EXTENSION WORK IN AGRICULTURE

The director submitted his report in full to the board at its last session. In addition to this the special report to the board at this time has been forwarded to each member. The work has been under divisions of Agricultural Extension Service and Agricultural Experiment Station.

These stations are the Central Station, at Raleigh; Pender Farm, Edgecombe Farm, Granville Farm, Iredell Farm, Black Land Farm, and Buncombe Farm.

These black lands are in fertility equal to any lands to be found. They are the deposit which the streams emptying in that section have brought down from the uplands of North Carolina and Virginia and have deposited at their mouths. These have been improved by the immense crops of leaves and weeds which have been produced upon them and added to this deposit.

Pender Farm.—The work in muscadine grapes, which is being conducted in cooperation with the Federal Department of Agriculture, is one of importance, not only to the State but to all parts of the United States in which these grapes are produced.

One of the outstanding herds of Jersey cattle in this State has been developed on this farm.

(a) The average number of pounds of milk produced by cows in this herd this year was 6,822.2.

(b) Average number of pounds of fat produced by whole herd this year was 345.6.

(c) Seventeen cows have been admitted to advanced registry.

(d) Pender Eminent Lass E: Milk 10,742.5 pounds; fat 564.66 pounds.

This is the State record for junior four-year old cow.

(e) Pender Eminent Lass J: (six months only—got sick) milk, 7,233.4 pounds; fat, 377.5 pounds. This is the State record as far as it went for senior three-year olds.

Granville Farm grows Tobacco.

MUSEUM

The Assistant Curator, Mr. Eagle, resigned in June and Mr. Harry T. Davis was appointed in his place. He is a trained geologist and mineralogist and as such will be very useful for museum work.

The museum affords a fair view of the resources of the State and is daily visited not only by many citizens of the city but by visitors from this and other states.

VETERINARY DIVISION

TICK ERADICATION

This State was first to begin work against the tick in 1794, as will be seen by the following bill:

“Laws 1795, Chap. 439, Sec. 2. No person shall hereafter drive any cattle from those parts of this State, where the soil is sandy and the natural production or growth of timber is the long leafed pine, into or through any of the highland parts of the State where the soil or growth of timber is of a different kind, between the first day of April and the first day of November in every year, under the penalty of four dollars for each and every head of cattle so driven, to be recovered and applied as before mentioned.”

This was one hundred years before the National Government began work in 1894 and it is to be regretted that some of our citizens seem

desirous that the State shall be the last to complete the work. Farmers should not be permitted to allow their cattle to reinfest the sections where tick eradication has been completed.

The following act, or one similar, has been enacted by all States where tick eradication is conducted, except North Carolina and Florida:

A BILL TO BE ENTITLED AN ACT TO PROVIDE FOR STATE-WIDE
TICK ERADICATION THROUGHOUT THE STATE OF NORTH CARO-
LINA.

Whereas, there are in North Carolina 22 counties under State and Federal quarantine on account of being infested with the cattle tick; and whereas, this cattle tick is a great menace to the cattle industry of this area and prevents the building up of this important industry; and whereas, this area is a great menace to the other counties of the State which are free of cattle ticks and the quarantine is expensive to maintain; and whereas, the annual losses from the cattle tick are in excess of a million dollars; and whereas, it has been proven that this pest can be completely eradicated from any farm, county or state by systematic inspection and dipping of all cattle; and whereas, an area many times larger than the State of North Carolina has been permanently freed of this menace since 1906; and whereas, the eradication of the cattle tick is absolutely essential to the development of a profitable cattle industry; and whereas, the boll weevil has made its appearance in this State, bringing disaster to the plague stricken territory; and whereas, the development of a profitable and progressive livestock industry, the basis of intensified and diversified farming has proven in our neighboring states the only successful solution of fighting the boll weevil; and whereas, the eradication of the cattle tick and the development of the cattle industry has enabled the plague stricken area in the states of Georgia, Mississippi and Alabama to rapidly recover from the disaster of the boll weevil invasion, prudence demands that we profit by their experience.

Therefore, the General Assembly of North Carolina do enact:

SECTION 1. That State-wide tick eradication shall be taken up in all counties that shall be, any time, partially or completely infested with the cattle tick (*Margaropus annulatus*) under the State Veterinarian acting under the authority of the Commissioner of Agriculture as hereinafter provided in this Act and as provided in all other laws, or parts of laws, of North Carolina and the Livestock Sanitary Laws and Regulations of the State Board of Agriculture, not in conflict with this Act.

SECTION 2. That on or before, 1921, the County Commissioners of the counties which are partially or completely infested with the cattle tick (*Margaropus annulatus*) shall provide such numbers of dipping vats as may be fixed by the State Veterinarian or his authorized representative, replace same when destroyed, and provide the proper chemicals and other material necessary to be used in the systematic work of tick eradication in such counties, which shall begin on said date, or, such subsequent date as may be fixed by the State Veterinarian with the approval of the Commissioner of Agriculture, said date not to be later than, 1921, the cost of said vats and chemicals, or any other expense incurred in carrying out the provisions of this Act, except Section 7, be paid out of the general county fund. If the County Commissioners shall fail, refuse or neglect to comply with the provisions of this Act on or before the first day of, or on or before the subsequent date as fixed by the State Veterinarian

with the approval of the Commissioner of Agriculture as hereinbefore provided, if such subsequent date is fixed, the State Veterinarian shall apply to any court or competent jurisdiction for writ of mandamus, or shall institute such other legal proceedings as may be necessary and proper to compel officials to comply with the provisions of this act.

SECTION 3. The County Commissioners of the said counties shall provide and pay the salaries of the necessary number of local county inspectors, to assist in this work, who shall be appointed and paid by the County Commissioners, subject to the approval of the State Veterinarian and commissioned by the Commissioner of Agriculture as quarantine inspector. If the services of any one of said inspectors are not satisfactory to the quarantine inspector in charge of the county, he shall give notice of such inefficiency to the Board of Commissioners of the county and the State Veterinarian, respectively, and the service of such inspector shall be immediately discontinued, his commission cancelled and another inspector appointed in his place. The salaries of said inspectors shall be fixed by the County Commissioners and shall be sufficient to insure the employment of competent men and shall be paid out of the general county fund.

SEC. 4. The State Veterinarian shall employ one State inspector in each county who shall be commissioned by the Commissioner of Agriculture as quarantine inspector and paid out of funds appropriated by the State Board of Agriculture for tick eradication and whose duty it shall be to assist in the work as directed by the State Veterinarian or his authorized representative.

SEC. 5. That any person, or persons, firms or corporations owning or having in charge any cattle, horses, or mules in any county where tick eradication shall be taken up, or is in progress under existing law, shall on notification by any quarantine inspector to do so, have such cattle, horses, or mules dipped regularly every fourteen days in a vat properly charged with arsenical solution as recommended by the United States Bureau of Animal Industry, under the supervision of said inspector at such time and place and in such manner as may be designated by the quarantine inspector. The dipping period shall be continued as long as may be required by the rules and regulations of the State Board of Agriculture, which shall be sufficient in number and length of time to completely destroy and eradicate all cattle ticks (*Margaropus annulatus*) in such county or counties.

SEC. 6. Quarantine and dipping notice for cattle, horses and mules, the owner or owners of which cannot be found, shall be served by posting copy of such notice in not less than three public places within the county, one of which shall be placed at the county courthouse. Such posting shall be due and legal notice.

SEC. 7. That cattle, horses or mules infested with, or exposed to, the cattle tick (*Margaropus annulatus*), the owner or owners of which, after 30 days written notice from a quarantine inspector, or such animals as are provided for in Sec. 6, shall fail or refuse to dip such animals regularly every fourteen days in a vat properly charged with arsenical solution as recommended by the United States Bureau of Animal Industry, under the supervision of a quarantine inspector, shall be placed in quarantine, dipped and cared for at the expense of the owner or owners by the quarantine inspector.

SEC. 8. Any expense incurred in the enforcement of section 7 of this Act and the cost of feeding and caring for animals while undergoing the process of tick eradication shall constitute a lien upon any animal and should the owner or owners fail or refuse to pay said expense, after three days notice, shall be sold by the sheriff of the county after twenty days advertising at the courthouse door and three other public places in the county, one of

said places to be in the immediate neighborhood of the place at which the animal was taken up for the purpose of tick eradication. The said advertisements shall state therein the time and place of sale, which place shall be where the animal is confined. The sale shall be at public auction and to the highest bidder for cash. Out of the proceeds of the sale the sheriff shall pay the cost of publishing the notices, of tick eradication process, cost of keeping and caring for the animals and the cost of the sale, which shall include \$1.50 in the case of each sale to said sheriff. The surplus, if any, shall be paid to the owner of the animal if he can be ascertained. If he cannot be ascertained within thirty days after such sale, then the sheriff shall pay such surplus to the County Treasurer for the benefit of the public school fund of the county, provided, however, that if the owner of the animal shall within twelve months after the fund is turned over to the County Treasurer as aforesaid prove to the satisfaction of the Board of County Commissioners of the county that he was the owner of such animal, then upon the order of said Board such surplus shall be refunded to the owner.

SEC. 9. It shall be the duty of the sheriff in any county in which the work of tick eradication is in progress to render all quarantine inspectors any assistance necessary in the enforcement of this Act and the Regulations of the North Carolina Department of Agriculture. If the sheriff of any county shall neglect or fail to render this assistance when so required he shall be guilty of a misdemeanor and be punishable at the discretion of the Court.

SEC. 10. The Commissioner of Agriculture by and with the consent of the State Board of Agriculture shall have full power to promulgate and enforce such rules or regulations that may hereafter be necessary to complete tick eradication in North Carolina.

SEC. 11. That any person, firm or corporation who shall violate any provision set forth in this Act or any rule or regulation duly established by the State Board of Agriculture, or any officer or inspector who shall wilfully fail to comply with any provision of this Act shall be guilty of a misdemeanor.

SEC. 12. That any person, or persons, who shall wilfully damage or destroy by any means any vat erected as herein provided for tick eradication shall be guilty of a felony and, upon conviction, shall be imprisoned not less than two years nor more than ten years in the State prison.

SEC. 13. All laws and parts of laws in conflict with this Act are continued in force so far as they affect the State offences committed prior to the ratification of this act and for no other purpose. Subject to provisions hereinbefore set out in this section all laws and parts of laws in conflict with this Act are hereby repealed.

SEC. 14. That this Act shall be in full force and effect from and after its ratification.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ANIMAL INDUSTRY
WASHINGTON, D. C.

PROGRESS IN TICK ERADICATION, JULY 1, 1906, TO DECEMBER 1, 1920

State	Counties Infected July 1, 1906	Counties Infected Dec. 1, 1920		Counties Released		Area Infected July 1, 1906	Area Infected Dec. 1, 1920	Area Released	
		Whole	Part	Whole	Part				
	Number	Number	Number	Number	Number	Square Miles	Square Miles	Square Miles	Per Cent
Alabama.....	67	2	3	62	3	51,279	3,252	48,027	94
Arkansas.....	75	25	7	43	7	52,525	19,632	32,893	63
California.....	15			15		79,924		79,924	100
Florida.....	51	47		4		54,861	47,980	6,881	13
Georgia.....	152	31		121		57,438	15,694	41,744	73
Kentucky.....	2			2				841	100
Louisiana.....	65	20	1	44	1	45,409	15,490	29,919	66
Mississippi.....	81			81		46,362		46,362	100
Missouri.....	4			4		1,386		1,386	100
North Carolina.....	75	20	1	54	1	37,365	10,087	27,278	73
Oklahoma.....	*61	2	2	57	2	47,890	4,047	43,843	92
South Carolina.....	44			44		30,495		30,495	100
Tennessee.....	42			42		16,987		16,987	100
Texas.....	198	102	6	90	6	191,835	100,606	91,279	48
Virginia.....	30	3	1	26	1	13,918	1,686	12,232	88
Totals.....	962	252	21	689	21	728,565	218,474	510,091	70

*Five of the 61 counties were quarantined only in part.

Areas released during the calendar year 1920 amounted to 32,171 square miles.

(Owing to discontinued local effort to complete tick eradication in areas released from quarantine it was found advisable to requarantine counties and parishes during the past year as follows: Alabama 1, Arkansas 9, and Louisiana 14, also a few small portions of counties and parishes in these States.)

HOG CHOLERA

The department has this well in hand, especially in the Piedmont and mountain sections.

SERUM PLANT

Serum is now \$1.10 per hundred weight, 4,370,407 c.c. of serum was distributed and 128,073 c.c. of virus. Amount of serum receipts, \$66,208.85. This makes the work almost self supporting, only a small appropriation being necessary.

TUBERCULOSIS

About 2.1 per cent of the cattle tested reacted. One hundred and ninety-six animals were slaughtered on account of this disease. Indemnity to the amount of \$5,734.63 was paid. The U. S. Department of Agriculture paid the same amount to owners of the cattle. This State appropriates annually \$5,000 for this purpose and for glanders. This is a good law, a man having an infected animal reports same and the animal is killed and paid for and not disposed of to spread the disease. There was not a single case of glanders.

Other diseases investigated were the following:

Forage poisoning, anthrax, sheep scab, diarrhoea, hemorrhagic septicemia, black leg.

ANIMAL INDUSTRY

Below is given a list of the various sub-departments of this work:

1. *Poultry.*

2. *Beef cattle and sheep.*—This department recommends that the dog tax law be amended. The counties paid tax in 1919, and also in 1920.

Through cooperative efforts in marketing 700 head of beef cattle were offered for sale at Spruce Pine September 23, 1920.

3. *Dairy Extension.*—Creameries made 23 per cent more butter than they did last year and the thirty cheese factories made 481,767 pounds of cheese.

The report of men's work shows that twenty-two cows produced or made 50 per cent more butter fat.

4. Mr. Gray gives a list of the purebred cows of the division in 1920.

ENTOMOLOGY

The principal insects combatted in the State were canker worms, leaf-louse and lady beetles on cotton, fall army worm, cotton boll worm, household insects. Cotton boll weevil appeared in Union, Anson, Richmond, Scotland, Robeson, Bladen, Sampson, Duplin and Onslow.

Inspections made by the division were as follows:

Nurseries and boll weevil, potato spraying, corn stalk border, dusting cabbage to control worms, pecan insects, insect survey, fall army worm, cut worm—some in each section of the State.

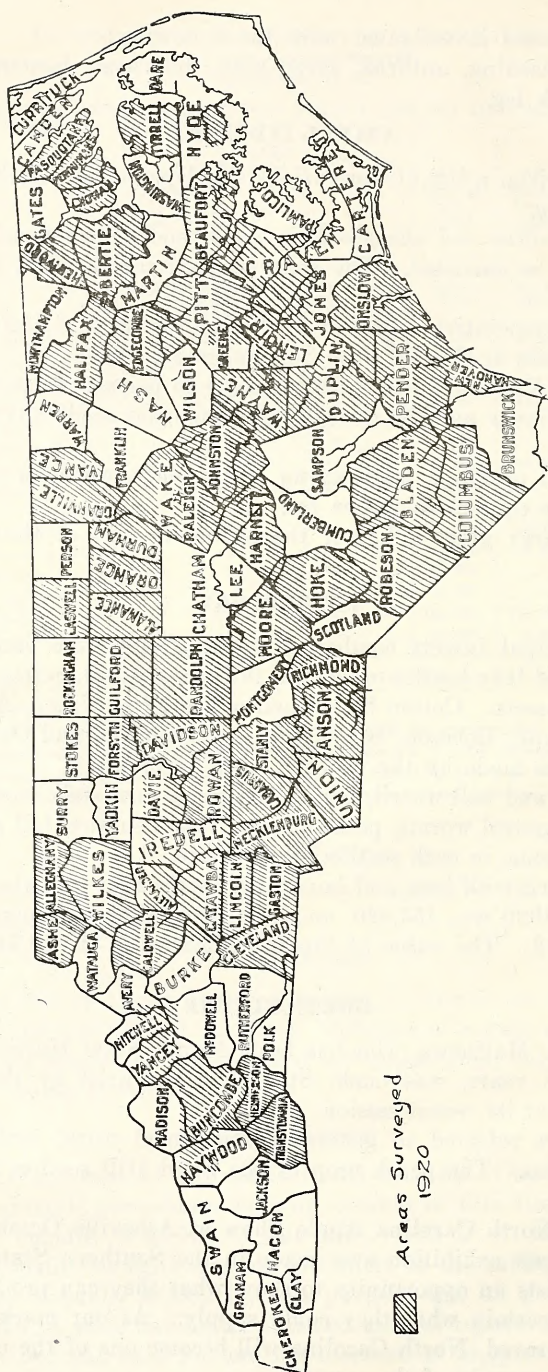
In the work with bees and honey it is estimated that the number of colonies in 1920 was 153,420, and that production of honey in pounds was 7,387,812. The value of this is estimated at \$2,216,343.60.


HORTICULTURE

Mr. C. D. Matthews, who has been Acting State Horticulturist for the last two years, was made State Horticulturist by the Board of Agriculture at its recent session.

His report referred to general horticultural work, including fruit crop estimates. The peach crop of the Sand Hill section is estimated at 250 cars.

Western North Carolina Apple Show at Asheville October 27 to 28 was the largest exhibition ever made in the Southern States. It gave the orchardists an opportunity to show what they can produce and the others to ascertain what they could supply. As our marketing facilities are improved, North Carolina will become one of the chief sources of the apple supply of the country.



 Areas Surveyed
1920

A North Carolina horticultural society was organized and time given to judging horticultural products at fairs.

Rotundifolia experiments were continued in coöperation with Federal Department of Agriculture at the Pender Test Farm in Pender County.

Experimental work in pomology and native fruits of North Carolina have been given much attention. Mr. Matthews has given information concerning the following:

Dehorning peach trees, peach breeding, hardiness of different varieties of peaches, studies with peaches, work with pecans, work with apples, work with sweet potatoes, work with Irish potatoes, work with cabbage, strawberry work, storage to prevent and control diseases, and grades and marketing. His budget is approved.

DIVISION OF AGRONOMY

Soil surveys of Tyrrell, Durham, Buncombe and Guilford have been completed and that on Onslow arranged to be done this winter.

Soil fertility has been given much study. To preserve or improve the soil, the farmer must not only apply lime and commercial fertilizer judiciously, but must practice rotation.

Investigations are conducted in Buncombe at Swannanoa, Iredell at Statesville, Central at Raleigh, Edgecombe at Rocky Mount, Washington at Wenona, Pender at Willard, Granville at Oxford.

These investigations cover the Mountain, Piedmont, and Coastal Plain sections and include soil tests, tobacco experiments at Reidsville and Granville, experiments with fertilizer, permanent tobacco seed or plant bed, the value of legumes, results with nitrate of soda on cotton, use of fertilizer on wheat on mountain soils, crop rotation, plant breeding, and seed improvement.

Community cotton improvement work was continued during the year and much attention given and interest shown in long staple cotton for North Carolina. Soil and crop extension work was conducted, and investigations made concerning sugar plants, which included work with sugar cane and sugar beets. Four bulletins and three circulars were issued.

BOTANY DIVISION

Over 1,700 samples of seed were examined; 100 more than were examined last year. One hundred and seventy-five pounds of tobacco seed were re-cleaned—enough to plant 36,000 acres of land. In 1913 only 732 samples of seed were tested; in 1920 there were 1,747 samples tested. More viable seed of the grasses and clovers are now being sold in the State.

A strong demand continues for our legume cultures, enough for about 2,700 acres having been distributed this year.

Grain Grading.—The Botanist has been licensed by the U. S. Department of Agriculture to place the federal grades on corn, wheat, and oats.

The following letters show how important prominent millers think this line of work is.

"Wilmington, N. C., September 30, 1920.

MR. J. L. BURGESS,
Raleigh, N. C.

DEAR SIR:—

Have your valued favor of the 28th, which we have read with interest. We note your Department has been licensed by the United State Department of Agriculture. We will observe your instructions as to forwarding samples for grading when we desire such work done.

In our judgment, this is one of the best moves the State has ever made and we feel sure it will result that way. You can rest assured we will co-operate in every way with you.

Very truly yours
BROWN BROTHERS (Merchant Millers)"

"Durham, N. C., September 30, 1920.

MR. J. L. BURGESS,
Raleigh, N. C.

DEAR SIR:—

We have your favor of the 28th, and beginning with October first we will mail you samples for inspection, which have previously been going to Baltimore.

Thanking you, we are,
Yours truly
AUSTIN-HEATON COMPANY (Merchant Millers)"

Lime Distribution.—The superintendent of lime will analyze samples of ground limestone which are sent to the department. He will also analyze each carload which is shipped from the State plant at Bridgeport, Tenn.

County demonstration agents inform me that the farmers of the State appreciate the benefit from the use of lime and the demand for it is growing, as will be noted from the following statements from W. L. Smarr, County Demonstrator for Lincoln County:

"The farmers who are using lime and growing legume crops are enthusiastic over the results. I wish to push this matter of limes and legumes twelve months in the year."

WORK IN HOME ECONOMICS

Fifty-nine counties were organized and 19,579 workers enrolled. There were 461 women's clubs and 460 girls' clubs organized.

SUBJECTS GIVEN ATTENTION

1. Home Millinery; by which much is saved in family expenses.
2. Foods, number of demonstrations:

405 Utilization of vegetables

377 Dairy Products

313 Poultry



NORTH CAROLINA STATE LIME PLANT, BRIDGEPORT, TENNESSEE

- 785 Bread Making
- 612 Child Feeding
- 293 Cooking for Invalids
- 267 Steam Pressure Cooking
- 392 Fireless Cookery
- 1596 Canning School lunches at 42 Schools

3. Bread campaigns

4. Canning:

- 1,670,426 containers were filled, valued at \$637,201
- 480,704 canned by women
- 104,047 canned by girls

5. Drying and brining—preparing meats

6. Muscadine grape culture:

- 5,057 Gallons grape juice made
- 576 Gallons grape juice sold

7. Housekeepers week

8. Home conveniences and kitchen improvements

9. Beautification of premises

10. Encampments held in 23 counties

11. Short courses for club members, 48 courses held in 1920

12. Fairs—State Fair

13. County councils and home bureaus

14. Poultry

15. Statistics

Approximate number of dairy cows in counties.....	35,958
Average price of milk per gallon.....	.66
Number cows purchased through your influence.....	178
Number demonstrators enrolled in butter making—girls 56, women...	692
Number demonstrations given in butter making.....	744
Number pounds reported made.....	93,205
Number of pounds reported sold.....	19,679
Average present price per pound of butter secured by demonstrators..	.66½
Average price secured for other homemade butter.....	.56

The board resolved that in making appropriations to aid exhibits at the State Fair that the exhibit of home economics and woman's work should be aided from the appropriation.

FOOD, DRUGS AND OIL

Adulteration of milk by addition of water or removal of fat in others, as was the case in adulteration of ice cream. Also addition of oleomargarine and cocoa butter, both good foods but not valuable as dairy products.

The quality of ice cream has been improved but it has been necessary to report several cases to the courts for attention.

In coöperation with the Federal Department of Agriculture excellent work has been done on scallops.

Bleached flour law is well complied with and the Federal Department of Agriculture requires this flour to be marked "Bleached Flour" in interstate commerce.

Bottling plant inspection has much improved the condition of these plants. Two of them do not obey the law or regulation and will be reported to the solicitor for prosecution.

Linseed oil inspection analyses of samples has not been reported promptly for want of chemists to do the work.

Illuminating oil or gasoline: 2,800 samples of oil and 7,500 samples of gasoline have been examined this year. The contamination of gasoline by oil has been less frequently shown and the practice is ceasing. Six cars of gasoline were refused sale in the State as they did not meet the requirements of the law. They were shipped out of the State.

The board instructed the oil chemist to prepare bills to provide for the proper labeling and inspection of all paints, turpentine and substitutes for same sold in the State; the law to carry inspection taxes for enforcement of same.

FARMERS' INSTITUTES

The board determined to discontinue the Farmer's Institute as heretofore held.

COOPERATIVE CROP REPORTING SERVICE AND AGRICULTURAL STATISTICS

This work has been thoroughly done and fills a long felt need in the work of the department. As shown by the following letter from the Secretary of Agriculture, it is important to both State and National work:

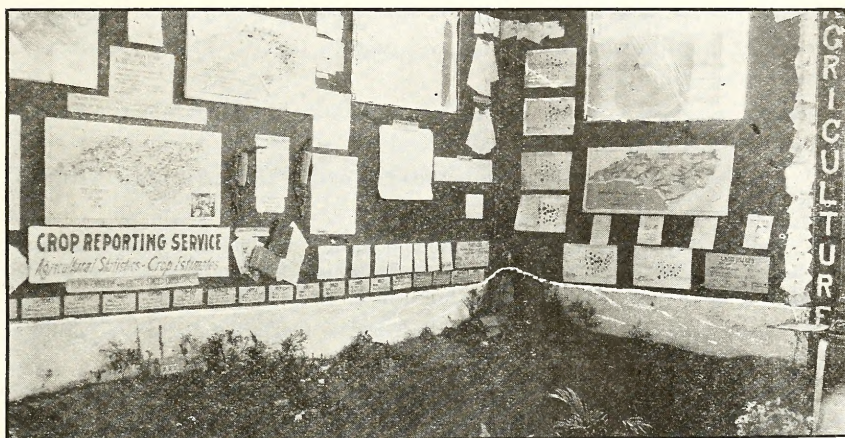
"My attention has been called by the Bureau of Crop Estimates to the splendid work being done in North Carolina by the Federal and State coöperative service for estimating crop and livestock conditions and production. The extensive publicity given to its reports by the press, the general acceptance of the substantial accuracy of its estimates, and the commendatory letters constantly received by it are definite indications of its popularity and value. The very satisfactory results secured through the coöperative arrangement in North Carolina shows clearly the possibilities and benefits of a similar work in other states.

"I wish to congratulate you upon the progress that has been made and express the hope that the coöperative relationship may be continued and developed, to the mutual advantage of this department and your department and of all those who are interested in the crop and livestock reporting service."

So far there is no machinery for the commissioner to get the reports from the farmers as they annually return their property for taxation. To be of value the statement should be authorized by law. A bill relating to this will be presented to the Legislature and we hope it will be enacted. Its reporting service is decidedly the best furnished by any State and we hope it will not be crippled by any unfavorable legislation.

This year the State appropriated \$10,367 and the National Government, in coöperation, \$11,602.

Mr. Parker recommends: More field travel, county reporting bureaus through the extension agents, the inclusion of publications from his



division under the regular publication appropriation, the issuance of monthly and annual summary bulletins, and that the bill of the Labor and Printing Department, amounting to \$367, be paid from the unexpended funds of this department.

WHAT HAS BEEN DONE IN 1920

Regular Reports Issued: 19 issues of monthly releases, 56,200 copies.

Special Reports Issued: 32 issues, cotton, tobacco, peanuts, etc., 18,600 copies.

State Record Sheets by Counties: 158 sheets. Each sheet provides for 7,540 items.

Special features: Annual acreage chart—5,000 copies, annual statistical bulletin, 500 copies, 52 pages; bulletin on value of agricultural statistics, 6,000 copies; original calculating table, a time and worry

saver, 500 made; Fair exhibit, State Fair tickets offered free to 350 best reporters. Specially compiled reports furnished as requested, plans made for getting results (information) back to farmers.

Envelopes used, 219,000 by local office; paper used, 216,000 sheets; 54,400 schedules.

Monthly Bulletins.—Reports on all crops: Farm Forecaster, 44,000 copies; cotton reports to press and specials, 4,800 copies; tobacco sales reports (separate), 8,100 copies; farm prices reports (begun September, 1920), 3,500 copies; two special reports, monthly, 8,400 copies; press releases (for all reports), 21,000 copies.

Office Routine.—Four times the correspondence of 1919; heavy filing by subject and cross referencing, 18 file cases, card indexes—7 drawers card lists, maintaining heavy lists of reports (now), 3,360. Addressograph lists—all, 7,765.

Complimentary.—Many thousands of bulletins and publications sent to coöperators and to others upon request.

Scope.—The work covered embraces the entire farm, (a very exacting and continuous work.)

1. *Crops.*—Acreages, conditions, yields, quality, production, prices, stocks on hand, etc. Per cent marketed, shipped, damages, abandonments, percentages of crops, when planted, when harvested, etc.

2. *Livestocks.*—Numbers, per cent each breed, mortality condition, values, breeding, stock, comparisons, etc.

3. *Various.*—Land values, wages, farm wood used, idle lands, progress farm work, plowing, harvesting, fertilizers used, amount costs, analyses.

4. *The Office Routine Embraces:*—Correspondence over 200 subject files (one of these covers 100 county survey folders and another the alphabetical correspondence) cross reference card indexes, card indexes of different classes or reporters, making addressograph plates, maintaining lists, addressing envelopes, preparing inquiry blanks, sending these out, receiving and tabulating reports, checking reporters, getting new aids, sending bulletins, periodicals and reports, rendering average of eleven exhaustive reports monthly. Mimeographing and multigraphing letters, inquiries, reports, etc., interpreting statistics into reliable matter, developing tobacco sales reports (one of heaviest tasks) 10 days one persons' time making classified permanent records.

5. *Results.*—Recognized as one of the leading states providing agricultural data. Annual bulletins interesting many prospective settlers from other states. The 1920 investment has yielded visibly wonderful results. Distinctly favorable attitude by the press, farmers and business interests. One farmer alone said that it had led him to save thousands of dollars. Many said the information had led them to plant and sell to advantage. Results are beyond expectations.

The reports of this division have been of great value to the commissioner in obtaining information about the State for which there are many calls.

THE DOG TAX TAGS

This act was provided for and came to the department about the time the Coöperative Crops report work was inaugurated.

Mr. J. H. Rhodes, Jr., who was appointed assistant in the crop work, was assigned to this work and his report is annexed. The Legislature has transferred this work to the educational department but this department conducted it up to January, 1921.

I think we should ask the Legislature to refund to the department two thousand dollars for the two years Mr. Rhodes acted in this capacity and was paid by the department.

SALES OF DOG TAX TAGS THROUGH STATE DEPARTMENT OF AGRICULTURE
DURING 1919

<i>County</i>	<i>No. Tags</i>	<i>Price</i>	<i>County</i>	<i>No. Tags</i>	<i>Price</i>
Alamance	2,000	\$ 60.00	Hyde	1,500	45.00
Alexander	1,300	39.00	Iredell	3,000	90.00
Anson	2,500	75.00	Jackson	1,500	45.00
Ashe	1,600	48.00	Johnston	3,000	90.00
Beaufort	1,500	45.00	Jones	1,100	33.00
Bertie	3,750	112.50	Lee	1,000	30.00
Bladen	4,000	120.00	Lincoln	1,600	48.00
Brunswick	500	15.00	Macon	1,517	45.50
Buncombe	1,500	45.00	Madison	2,500	75.00
Burke	1,200	36.00	McDowell	1,000	30.00
Cabarrus	2,500	75.00	Mitchell	500	15.00
Caldwell	1,500	45.00	Montgomery	1,230	36.90
Catawba	2,000	60.00	Moore	1,500	45.00
Chatham	2,500	75.00	Nash	3,500	105.00
Chowan	800	24.00	New Hanover	1,500	45.00
Clay	1,000	30.00	Onslow	2,000	60.00
Cleveland	2,000	60.00	Orange	2,000	60.00
Columbus	3,000	90.00	Pasquotank	1,500	45.00
Craven	1,500	45.00	Person	1,800	54.00
Dare	100	3.00	Polk	1,000	30.00
Davie	1,500	45.00	Rutherford	1,500	45.00
Duplin	1,000	30.00	Stanly	1,850	55.50
Durham	1,500	45.00	Stokes	1,900	57.00
Edgecombe	4,500	90.00	Tyrrell	600	18.00
Forsyth	1,000	30.00	Washington	1,000	30.00
Franklin	2,000	60.00	Watauga	1,000	30.00
Gaston	2,000	60.00	Wilkes	2,000	60.00
Graham	500	15.00	Wilson	5,000	150.00
Granville	2,000	60.00	Yadkin	1,500	45.00
Greene	2,000	60.00	Yancey	1,000	30.00
Harnett	3,000	90.00	Robeson	4,000	120.00
Haywood	2,000	60.00			
Henderson	1,000	30.00			
Hertford	2,200	66.00			
			Total, 65 counties	118,547	\$3,511.40

STATEMENT OF DOG TAX TAGS PURCHASED THROUGH STATE DEPARTMENT OF
AGRICULTURE FOR YEAR 1920

Complete to November 18.

<i>County</i>	<i>No. Tags</i>	<i>Price</i>	<i>County</i>	<i>No. Tags</i>	<i>Price</i>
Alamance	3,000	\$90.00	Hyde	1,500	45.00
Anson	2,500	125.00	Iredell	2,500	125.00
Ashe	1,600	80.00	Jackson	1,000	50.00
Avery	50	1.50	Johnston	3,000	150.00
Bertie	3,750	112.00	Lee	1,000	30.00
Buncombe	1,500	45.00	Lincoln	1,400	42.00
Burke	600	18.00	Macon	1,300	39.00
Cabarrus	2,200	110.00	McDowell	1,000	25.00
Caswell	1,800	54.00	Nash	1,000	30.00
Catawba	2,500	75.00	New Hanover	1,000	30.00
Chatham	2,500	125.00	Pasquotank	1,000	30.00
Chowan	700	21.00	Perquimans	1,000	30.00
Columbus	3,000	80.00	Person	1,700	51.00
Craven	1,500	45.00	Rutherford	1,500	45.00
Davie	1,600	80.00	Sampson	2,000	60.00
Durham	1,650	45.50	Stanly	2,000	60.00
Edgecombe	4,500	225.00	Stokes	1,600	80.00
Franklin	3,000	90.00	Swain	1,500	45.00
Gaston	2,000	60.00	Tyrrell	600	30.00
Graham	300	15.00	Watauga	800	24.00
Greene	2,000	60.00	Wilkes	2,000	60.00
Guilford	3,500	105.00	Wilson	4,000	200.00
Haywood	2,000	60.00	Robeson	2,000	60.00
Henderson	1,000	30.00	Rockingham	3,000	90.00
Hertford	1,000	30.00			
Hoke	700	21.00	Total, 50 counties	89,850	\$3,234.00

ORGANIZED DRAINAGE DISTRICTS IN NORTH CAROLINA, ACCORDING
TO CENSUS OF 1910

Total area in organized drainage enterprises, acres..... 543,288

Improved farm land, acres..... 204,298

Timbered and cut over land, acres..... 201,727

Other unimproved land, acres..... 137,263

Total land area of State..... 31,193,600

Area of State in drainage enterprises.....1.7 per cent

Swampy or wet or subject to overflow, in organized drainage
enterprises, acres..... 73,928

Cost of organized drainage enterprises, total..... \$3,623,518



OFFICE OF INFORMATION OF THE DEPARTMENT OF AGRICULTURE AT THE STATE FAIR

WILLIAM NORMAN ACCOUNT

Under provision of chapter 182, Private Laws of 1917, William Norman has been paid the following amount:

1917	\$123.78
1918	241.60
1919	301.85
	<hr/>
	\$667.23

Norman lost his arm while in the employment of the board at the Transylvania farm, and the law applying to his case was passed by the Legislature.

The Department had the following correspondence from the Japanese authorities concerning the tobacco industry.

Tokyo, 15 July, 1920.

*The Director General
of the Agriculture Department of North Carolina.*

DEAR SIR:—

We beg to have the liberty to write you in desire to know about Tobacco industry of your place. We shall be much obliged to you if you will kindly send us annual reports of tobacco industry in 1918, 1919 and prospectus of tobacco industry or the like.

Please inform us the subscription fee; we will remit it at once.

Hoping your kind attention will be given to this matter, we have the honour to be, Dear Sir,

Yours respectfully,

R. YEZOYE, SONS & Co., INC.

Tokyo, September 15, 1920.

W. A. GRAHAM Esq.,
*Commissioner of North Carolina
Department of Agriculture.*

DEAR SIR:—

We beg to express our sincere thanks for your kind attentions bestowed upon our firm.

At the same time, we received a very fine and useful "Year Book". It gives us indeed a very good idea about tobacco in your region, and on making business with American leaf.

We noted with very warm feeling that you are the son of the famous W. A. Graham who sent Commodor Perry to our country on the errand of peace and humanism. We, exporter and importer, might especially say that we owe very much to their merits to cast our country the light of civilization, thus we can now enjoy the good business with the nations abroad for the mutual advantages.

We are, Dear Sirs,

Yours very truly,

R. YEZOYE, SONS & Co., INC.

The affairs of the department have gone smoothly on. No friction in any quarter and when, for any cause, the work required any one to work for a time in a division other than the one they were employed in, the requests have been cheerfully complied with. While the chief clerk has been absent for a short time on account of illness, she has kept her work so well in hand that there was little or no trouble in closing her accounts for the year.

Mr. Barnes has been diligent and faithful. When he reports accounts or bills as correct, it has never been found necessary to have any one else examine the matter.

I wish to tender to the head of each division, and to all employees of the department, my thanks and appreciation for their attention to the matters entrusted to them and for their courtesy to the commissioner.

The financial statement for the two years follows: The vouchers in the State Treasurer's office have been examined by the committee appointed by the Legislature to examine the books of the different departments and reported as correct.

I also annex as part of this report the reports of the heads of divisions that it may show what each division is doing.

The books of the department are examined every six months by the finance committee of the Board of Agriculture.

The board resolved to ask that the time of the meeting of the board be changed from the first to the second Wednesday in December. It occurs occasionally, as it did this year, that Wednesday comes on the first day of the month and it is impossible to prepare a financial statement covering everything up to November 30.

The terms of the following members of the board will expire on March 11, 1921: C. E. Mitchell, second district, R. W. Scott, fifth district and I. N. Payne, eight district.

With thanks and adoration to our Heavenly Father for the blessings which he has conferred upon the people of the State and with prayers that He may enable us to live so that these blessings and mercies may be continued, this report is respectfully submitted.

W. A. GRAHAM, *Commissioner.*

FINANCIAL STATEMENT

DECEMBER 1, 1918---NOVEMBER 30, 1920

Receipts December 1, 1918 to November 30, 1919.....	\$400,851.99
Interest on Deposits December 1, 1918 to November 30, 1919.....	2,159.98
Receipts December 1, 1919 to November 30, 1920.....	453,187.33
Interest on Deposits December 1, 1919 to November 30, 1920.....	2,765.54
Total.....	\$858,964.84

DISBURSEMENTS

December 1, 1918 to November 30, 1919.....	\$387,720.17
December 1, 1919 to November 30, 1920.....	478,649.75
Total.....	\$866,369.92

Receipts December 1, 1918 to November 30, 1920.....	\$858,964.84
Balance November 30, 1918.....	32,737.98
	\$891,702.82

Disbursements December 1, 1918 to November 30, 1920.....	866,369.92
Balance November 30, 1920.....	\$ 25,332.90
Outstanding Warrants November 30, 1920.....	23,349.49

Balance in State Treasurer's Office Nov. 30, 1920....\$ 48,682.39

Receipts June to December, 1919.....	\$129,601.14
Receipts June to December, 1920.....	105,591.88

ITEMIZED RECEIPTS

	<i>Dec. 1, 1918</i>	<i>Dec. 1, 1919</i>	<i>Total</i>
	<i>Nov. 30, 1919</i>	<i>Nov. 30, 1920</i>	
Fertilizer tags.....	\$192,247.75	\$244,359.26	\$436,607.01
Cotton-seed meal tags:.....	29,566.27	20,061.47	49,627.74
Feed stamps	51,825.57	52,782.39	104,607.96
Test farms	27,642.50	35,288.08	62,930.58
Hog-cholera serum.....	63,895.42	63,361.76	127,257.18
Linseed oil stamps.....	1,256.05	1,385.65	2,641.70
Lime and marl.....	14,947.51	14,239.33	29,186.84
Bleached flour licenses.....	3,915.00	4,680.00	8,595.00
Seed licenses	2,175.00	2,125.00	4,300.00
Legume Laboratory	1,371.65	1,131.80	2,503.45
Condimental feed licenses.....	1,160.00	1,520.00	2,680.00
Irregularities	1,345.00	1,189.22	2,534.22
Bottling Plant licenses.....	1,330.00	1,190.00	2,520.00
Animal Industry Farm.....	2,267.13	2,821.97	5,089.10
Refunds	710.90	1,035.75	1,746.65
Testing and cleaning seed.....	99.50	117.90	217.40
Transylvania Farm note.....	1,120.00	1,180.00	2,300.00

ITEMIZED RECEIPTS—*Continued.*

	<i>Dec. 1, 1918</i>	<i>Dec. 1, 1919</i>	
	<i>Nov. 30, 1919</i>	<i>Nov. 30, 1920</i>	<i>Total</i>
Buckle Swamp Drainage District.....	1,597.71	.....	1,597.71
Tobacco Sales	601.29	.....	601.29
Potato inspection	57.00	.....	57.00
Oil and Gasoline Division.....	1,500.00	2,000.00	3,500.00
Incidentals	20.74	.....	20.74
Fire loss	200.00	.....	200.00
Cows sold, quarantine.....	.....	203.60	203.60
Warehouse fund .....	.....	6.00	6.00
Payment on marl plant.....	.....	2,000.00	2,000.00
Sale loose cotton samples.....	.....	500.00	500.00
Marketing inspection fee.....	.....	4.00	4.00
Posters .....	.....	4.15	4.15
Interest on bank deposits.....	2,159.98	2,765.54	4,925.52
Total.....	\$403,011.97	\$455,952.87	\$858,964.84

SUMMARY OF DISBURSEMENTS FOR LAST TWO FISCAL YEARS ENDING NOVEMBER 30, 1919, AND NOVEMBER 30, 1920

EXECUTIVE OFFICE

<i>Distribution</i>	<i>1919</i>	<i>1920</i>	<i>Total</i>
Salaries	\$10,079.91	\$12,099.84	\$22,179.75
Inspection	15,355.89	16,064.53	31,420.42
Board and committee meetings.....	3,153.72	2,160.58	5,314.30
Tags	9,241.85	11,386.67	20,628.52
Postage, stationery, telephone, etc.....	1,889.54	1,052.66	2,942.20
Freight, express and drayage.....	36.34	63.63	99.97
Heat, light and water.....	2,373.66	1,157.72	3,531.38
Incidentals	76.71	75.25	151.96
Library and subscriptions.....	93.00	105.50	198.50
Furniture and fixtures.....	58.05	34.45	92.50
Traveling expenses.....	445.59	236.15	681.74
Building and repairs.....	365.25	219.00	584.25
State Fair.....	584.36	811.29	1,395.65
Publications	6,447.03	6,973.89	13,420.92
Fairs and exhibits.....	3,582.77	10,780.68	14,363.45
Expenses William Norman.....	301.85	.....	301.85
Community Service.....	800.00	800.00	1,600.00
Contingent	4,319.46	1,624.69	5,944.15
Farmers Convention.....	500.00	750.00	1,250.00
Pictures for Rural Schools.....	356.12	746.50	1,102.62
Emergency help.....	.....	323.10	323.10
Lime and marl work.....	25,152.33	20,316.30	45,468.63
Cotton Warehouse inspection fee.....	25.25	.....	25.25
O. J. McConnell, Special.....	500.00	.....	500.00
Prize for essay A. & E. College.....	25.00	.....	25.00
Book prizes, boys and girls.....	.....	48.72	48.72
Immigration	30.00	.....	30.00
Lights and water, Iredell farm.....	.....	1,500.00	1,500.00
Six warehouse models.....	.....	325.00	325.00

ANALYTICAL DIVISION

<i>Distribution</i>	1919	1920	<i>Total</i>
Salaries	\$22,238.96	\$20,686.23	\$42,925.19
Apparatus and reagents.....	3,687.41	3,724.90	7,412.31
Traveling expenses.....	495.80	599.29	1,095.09
Office Expenses.....	1,230.47	1,546.58	2,777.05

TEST FARMS

Buncombe Farm	7,792.84	9,044.12	16,836.96
Pender Farm.....	15,161.07	22,678.52	37,839.59
Edgecombe Farm.....	11,274.26	15,066.17	26,340.43
Iredell Farm.....	11,524.69	11,919.08	23,443.77
Granville Farm.....	6,213.16	14,872.02	21,085.18
Washington Farm.....	5,104.58	5,949.75	11,054.33
Miscellaneous Test Farm expenses.....	150.87	94.23	245.10

FARMERS INSTITUTES

Salaries	2,420.00	4,008.26	6,428.26
Expenses	3,431.56	809.19	4,240.75

MUSEUM

Salaries	5,633.03	6,249.84	11,882.87
Maintenance and improvements.....	886.34	726.76	1,613.10

MARKETS AND RURAL ORGANIZATIONS

Salaries	5,839.14	10,942.05	16,781.19
Expenses	5,720.05	11,873.30	17,593.35
Potato work	748.43	.....	748.43

DRAINAGE WORK

Salaries	1,159.03	1,629.96	2,788.99
Expenses	744.18	807.12	1,551.30

JANITORS

Salaries	1,030.00	1,030.00
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DIVISION STENOGRAPHERS

Salaries	7,279.90	7,279.90
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TEST FARM DIRECTORS AND AGRICULTURAL EDITOR

Salaries	4,921.61	4,921.61
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FOOD AND OIL DIVISION

Salaries	4,057.20	3,081.22	7,138.42
Expenses	2,012.06	1,962.70	3,974.76

BOTANY DIVISION

Salaries	6,723.88	7,999.92	14,723.80
Expenses	1,187.78	1,795.67	2,983.45

BIENNIAL REPORT

ENTOMOLOGY DIVISION

<i>Distribution</i>	<i>1919</i>	<i>1920</i>	<i>Total</i>
Salaries	\$ 6,511.92	\$11,380.64	\$17,892.56
Field inspection.....	2,127.37	2,449.67	4,577.04
Office and laboratory.....	871.31	1,145.30	2,016.61
Emergency		1,041.00	1,041.00

MULTIGRAPH WORK

Salary	479.23	574.92	1,054.15
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FARM ENGINEERING

Salary		1,428.60	1,428.60
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DIVISION OF HORTICULTURE

Salaries	3,228.61	6,799.92	10,028.53
Equipment and supplies.....	504.40	497.51	1,001.91
Traveling and orchard demonstration.....	1,127.67	1,413.68	2,541.35
Horticulturist's salary (unexpended).....		1,307.14	1,307.14

DIVISION OF VETERINARY AND QUARANTINE

Salaries	6,631.90	8,899.92	15,531.82
Sanitary work and travel.....	2,627.93	2,272.76	4,900.69
Tuberculosis work	3,253.62	4,479.86	7,733.48
Anti hog cholera serum.....	56,836.38	57,497.66	114,334.04
Hog cholera field work.....	4,276.47	5,405.97	9,682.44
Tick eradication.....	12,061.57	25,182.86	37,244.43

DIVISION OF ANIMAL INDUSTRY

Salaries	6,494.19	11,892.17	18,386.36
Expenses	22,066.82	26,648.57	48,715.39
Coöperative Demonstration	21,333.52	24,131.78	45,465.30

DIVISION OF SOIL WORK AND AGRONOMY

Salaries	9,852.46	11,044.57	20,897.03
Agronomy expenses	2,506.03	2,499.50	5,005.53
Soil work expenses.....	3,904.59	4,986.11	8,890.70

TOBACCO WORK

Salary	363.00	499.92	862.92
Expenses	305.50	936.25	1,241.75

DIVISION OF CROP STATISTICS

Salary	1,000.00	1,500.00	2,500.00
Expenses	845.31	9,058.83	9,904.14

Totals.....\$387,720.17 \$478,649.75 \$866,369.92

DIVISION OF FOOD AND OIL INSPECTION

Financial Statement for Two Years Ending November 30, 1920

Gasoline Inspection

ACCOUNT WITH SECRETARY

Stamps on hand close November, 1918.....	\$ 5,819.07	
Stamps received from Secretary December, 1918, to November, 1920, inclusive		301,102.50
Stamps sold during same period as per receipts deposited in State Treasury.....	\$305,112.11	
Stamps on hand close November, 1920.....	1,809.46	
Total	\$306,921.57	\$306,921.57

ACCOUNT WITH STATE TREASURER

Balance in State Treasury close November, 1918.....	\$ 362.52	
Receipts December, 1918 to November, 1920 inclusive, deposited in State Treasury.....		305,112.11
Warrants drawn during same period for expenses....	\$ 52,890.56	
Warrants drawn during same period in favor of the State Treasurer for transfer to "General Fund"....	251,000.00	
Balance in State Treasury subject to warrant, with close of November, 1920.....	1,584.07	
Total	\$305,474.63	\$305,474.63

Illuminating Oil Inspection

ACCOUNT WITH SECRETARY

Stamps on hand close November, 1918.....	\$ 1,939.48	
Stamps received from Secretary December, 1918 to November, 1920, inclusive.....		136,814.79
Stamps sold during same period as per receipts deposited in State Treasury.....	\$135,649.11	
Stamps on hand close November, 1920.....	3,105.16	
Total	\$138,754.27	\$138,754.27

ACCOUNT WITH STATE TREASURER

Balance in State Treasury close November, 1918.....	\$ 572.88	
Receipts December, 1918, to November, 1920, inclusive, deposited in State Treasury.....		135,649.11
Warrants drawn during same period for expenses....	\$ 45,731.63	
Warrants drawn during same period in favor of the State Treasurer for transfer to "General Fund"....	89,000.00	
Balance in State Treasury subject to warrant, with close of November, 1920.....	1,490.36	
Total	\$136,221.99	\$136,221.99

ALPHABETICAL LIST OF NATIVE MINERALS

- | | |
|--------------------|---------------------------------|
| 1 Actinolite | 49 Copper |
| 2 Albite | 50 Corundum |
| 3 Allanite | 51 Covellite |
| 4 Altaite | 52 Crocokolite |
| 5 Alunogen | 53 Crocoite |
| 6 Anatase | 54 Cullasageeite |
| 7 Andesite | 55 Cuprite |
| 8 Anglesite | 56 Cuprosheelite |
| 9 Anthophyllite | 57 Cyanite |
| 10 Anthracite coal | 58 Cyrtolite |
| 11 Antimony | 59 Deweylite |
| 12 Apatite | 60 Diamond |
| 13 Arsenopyrite | 61 Diaspore |
| 14 Arfvedsonite | 62 Domolite |
| 15 Argentite | 63 Dudleyite |
| 16 Asbestos | 64 Dufrenite |
| 17 Aurlite | 65 Enstatite |
| 18 Augite | 66 Epidote |
| 19 Autunite | 67 Fergusonite |
| 20 Azurite | 68 Fibrolite |
| 21 Barite | 69 Fluorite |
| 22 Barnhardtite | 70 Garnet |
| 23 Beryl | 71 Galena |
| 24 Biotite | 72 Gahnite |
| 25 Bismite | 73 Genthite |
| 26 Bismutite | 74 Glauconite |
| 27 Bismuthinite | 75 Gold |
| 28 Bituminous coal | 76 Goslarite |
| 29 Bornite | 77 Gothite |
| 30 Breunnerite | 78 Graphite |
| 31 Bronzite | 79 Gummite |
| 32 Brookite | 80 Halite |
| 33 Calamine | 81 Halloysite |
| 34 Calcite | 82 Hatchettolite |
| 35 Cassiterite | 83 Hematite |
| 36 Cerusite | 84 Hiddenite |
| 37 Cerargyrite | 85 Hyalite |
| 38 Cerolite | 86 Hydrofergusonite |
| 39 Chalcopyrite | 87 Ilmenite |
| 40 Chalcocite | 88 Iron (meteoric) |
| 41 Chrysocolla | 89 Itacolumyte |
| 42 Chromite | 90 Jefferisite |
| 42 Cholorite | 91 Kammererite (Var. penninite) |
| 43 Chlorite | 92 Kaolinite |
| 44 Chloritoid | 93 Kerrite |
| 45 Chrysilite | 94 Labradorite |
| 46 Chalcanthite | 95 Lazulite |
| 47 Chalcedony | 96 Leucopyrite |
| 48 Columbite | 97 Limonite |

98 Lucasite	142 Samarskite
99 Maconite	146 Scorodite
100 Magnesite	143 Saponite
101 Magnetite	144 Scheelite
102 Malachite	145 Schreibersite
103 Marcasite	147 Serpentine
104 Margarite	148 Siderite
105 Marmolite	149 Silver
106 Martite	150 Sillimanite
107 Melanterite	151 Smaragdite
108 Malaconite	152 Sphalerite
109 Molybdenite	153 Sperrylite
110 Molybdite	154 Spodumene
111 Monazite	155 Spinel
112 Montanite	156 Staurolite
113 Montmorillonite	157 Steatite
114 Muscovite	158 Stibnite
115 Nagyagite	159 Stilbite
116 Niter	160 Stolzite
117 Octahedrite	161 Succinite
118 Oligoclase	162 Sulphur
119 Olivenite	163 Talc
120 Orthoclase	164 Tantalite
121 Opal	165 Tetradymite
122 Penninite	166 Tetrahedrite
123 Phlogopite	167 Thorite
124 Phosphuranylite	168 Thulite
125 Picrolite	169 Titanite
126 Pleonaste	170 Tourmaline
127 Polycrase	171 Tremolite
128 Prochlorite	172 Troilite
129 Psilomelane	173 Uraninite
130 Pseudomalachite	174 Uranotil
131 Pyrite	175 Vermiculite
132 Pyromorphite	176 Vivianite
133 Pyrolusite	177 Wad
134 Pyrophyllite	178 Wavellite
135 Pyrrhotite	179 Willcoxite
136 Pyroxene	180 Wolframite
137 Quartz	181 Xanthitane
138 Rhodochrosite	182 Xenotime
139 Rogersite	183 Zircon
140 Rutherfordite	184 Zoisite
141 Rutile	185 Radium

LIST OF NATIVE TREES OF NORTH CAROLINA

(PREPARED BY N. C. GEOLOGICAL AND ECONOMIC SURVEY)

Shortleaf or rosemary pine	Black oak
Longleaf pine	Southern red or Spanish oak
Table Mountain or prickly pine	Black jack oak
Black pine	Water oak
Pond pine	Willow oak
White pine	Live oak
Loblolly pine	Chestnut oak
Scrub or spruce pine	Swamp chestnut oak
Red spruce	Swamp white oak
Balsam	Laurel oak
Hemlock	Overcup oak
Carolina hemlock	Post oak
Cypress	Pin oak
Juniper or white cedar	Red oak
Red cedar	Slippery elm
Palmetto	White elm
Black willow	Winged elm
Cottonwood	Hackberry
Large-toothed aspen	Red Mulberry
Carolina poplar	Umbrella tree
White walnut or butternut	Magnolia
Black walnut	Mountain magnolia
White hickory	Sweet or white bay
Bitternut hickory	Yellow poplar or tulip tree
Water hickory	Red bay
Pignut hickory	Smooth red bay
Shellbark hickory	Sassafras
Pale hickory	Sweet gum
Southern shellbark hickory	Sycamore
Small nut hickory	Mountain ash
Ironwood	Service tree
Hornbeam	Crab apple
River birch	Narrow leaved crab apple
Black birch	Hawthorn (several species)
Yellow birch	Cock-spur thorn or Hog apple
Paper birch	Barberry-leaved haw
Beech	Dotted thorn
Chestnut	Green haw
White oak	Summer haw
Upland willow oak	Spatulated thorn
Shingle oak	Black cherry
Scrub or turkey oak	Red cherry
Spanish or scarlet oak	Hog or wild plum
Scrubby post oak	Chickasaw plum
Swamp chestnut oak	Sloe
Swamp Spanish oak	Laurel cherry
Swamp red oak	Honey locust

Red bud	Loblolly bay
Yellow-wood	Dogwood
Black locust	Water gum
Prickly ash	Black gum
Holly	Tupelo gum
Carolina maple	Sourwood
Southern sugar maple	Persimmon
White-barked sugar maple	Silverbell tree
Ash leaved maple or box elder	Green ash
Black maple	Red ash
Striped maple	Water ash
Red maple	Pumpkin ash
Sugar maple	White ash
Buckeye	Biltmore ash
White linn or linden	Black haw
Southern linn or linden	Blue haw
American linn or linden	

The following trees are not native but have escaped from cultivation, and in some places are apparently growing wild:

Weeping willow	Sweet cherry
White willow	Mimosa
White poplar	Coffee tree
Lombardy poplar	Copal
Balm of Gilead	Chinaberry
White mulberry	Paulownia
Paper mulberry	Catalpa
Osage orange	

The following are usually shrubs in North Carolina but occasionally develop into small trees:

Ward's willow	Yopon
Chinquapin	Dahoon holly
Bear oak	Deciduous holly
Pawpaw	Mountain holly
Witch hazel	Smooth buckeye
Swamp service berry	Buckthorn
Baynton's thorn	Hercules club
Parsley haw	Cornel or blue dogwood
Waxy thorn	Great laurel
Washington thorn	Mountain ivy
Chapman thorn	Sparkleberry
Clammy locust	Sweet leaf
Staghorn sumach	Fringe-tree
Black or dwarf sumach	Devil wood, wild olive
Poison sumach	Possum haw
Cyrilla or leatherwood	Nanny-berry

REPORT OF DIVISION OF MARKETS AND RURAL ORGANIZATION IN NORTH CAROLINA

By B. F. BROWN, *Chief of Division*

COTTON WAREHOUSES

Eighteen warehouses have been completed, or application for loan has been made, of capacity of 23,400 bales.

Attention is given by Mr. T. B. Parker, Superintendent of Warehouses, whenever his services are requested. He is assisted by Mr. J. M. Workman of the United States Department of Agriculture.

INSPECTION AND OPERATION OF WAREHOUSES

Attention to classing and grading is under the supervision of Mr. P. H. Hart.

Cotton grading and marketing offices were established at Tarboro, Lumberton, Clinton, Fayetteville and Raleigh for the purpose of accommodating the citizens of the counties in which these offices are located, but assistance is given upon request regardless of the location.

In order to obtain a grader the County Commissioners appropriated the sum of \$250.00 for this purpose.

Edgecombe graded 6,442 bales; Sampson and Duplin 6,334 bales; Robeson 3,935 bales; Cumberland 1,743 bales; Raleigh 1,339 bales for purchasers and 3,306 bales for cotton mills.

LIVESTOCK

CATTLE

Sale of Feeder and Stock Cattle.

There is a Cattleman's Association of the Grower and Feeder in Avery, Mitchell and Yancey counties. The sale of 700 cattle was conducted at Spruce Pine.

Hogs

The offering for sale of hogs is conducted in many of the counties and this relieves the local markets from being glutted with the sale of hogs.

LAMBS

This is being promoted by Mr. R. S. Curtis, one of the employees of this department.

WOOL

On account of the low price of wool this season it was not thought advisable to urge farmers to sell, but arrangements were made with the factory at Elkin to manufacture all wool into cloth and blankets at certain prices. This seems to have given quite a relief to the wool growers.

CREDIT UNIONS

This has been conducted by Mr. J. M. Henley. There are at this time thirty-three credit unions incorporated in this State, sixteen among the white farmers and seventeen among the colored farmers. These are scattered over the State from New Hanover County to Madison County.

Reports of these unions show that those taking advantage of them saved a considerable sum in the amount for which they pay for supplies and also by coöperation received better prices for what they have to sell.

Carmel Credit Union loaned to its members \$5,750.00 in cash and \$6,632.50 on time loans.

Report, September 30, 1920:

<i>Members</i>	<i>Deposits</i>	<i>Loans</i>	<i>Total Resources</i>
1387	\$52,343.81	\$86,333.44	\$102,103.12

Considerable attention has been given to the sale of perishable products and considerable money saved to those making these sales. Especial attention has been given to cowpeas and soy beans and sweet potatoes and mountain products.

STANDARDIZATION AND GRADING OF PRODUCTS

EXHIBITS

Few fair exhibits were installed this year. A three-booth-exhibit was put on at the State Fair. One booth exhibit featured cotton warehousing. The second exhibit was at the Western North Carolina Apple Show at Asheville.

A list of publications of the Market Division follows:

Farmers Market Bulletin, issued monthly

Weekly Price Report

Weekly Hog Market Quotations (November to June)

Monthly Review of Producer's Prices (Discontinued since April)

Monthly Financial Statement of North Carolina Credit Unions

Circular on Harvesting, Grading and Packing Peaches

News articles on Cotton Grading, State Warehouse Systems, Grade and Package Standardization and peanut, Livestock and Potato and Wool Markets

kets

THE NORTH CAROLINA COTTON WAREHOUSE SYSTEM

During the 1919 session of the General Assembly a law for the North Carolina Warehouse System was enacted to be administered by the State Board of Agriculture with power to make and enforce such rules and regulations as may be necessary to make the law effective and to answer the purposes for which it was enacted.

The act provided for a tax of 25 cents per bale on all cotton ginned in the State in the two years ending June 30, 1921. This 25 cents per bale tax shall be paid into the State Treasury to be held there as a guarantee fund to safeguard the State Warehouse System against any loss not otherwise covered. Not less than one half of this fund shall be invested in United State Government or Farm Loan bonds or North Carolina bonds, and the remainder may be loaned for the building of cotton storage warehouses under this system, as provided for in the act. Quite a number of cotton storage warehouses have already been established under this act, to which loans have been made according to the following report showing collections and disbursements of the money collected from the 25 cents a bale tax.

Market	Less than $\frac{1}{8}$	Length of Staple in Inches						Section	Average Staple Length
		$\frac{3}{8}$	$\frac{1}{2}$	1	$1\frac{1}{8}$	$1\frac{1}{2}$	$1\frac{3}{4}$ and Longer		
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent		
Ahoskie.....	25	65	7	2	1			Coastal...	0.86
Charlotte.....	$\frac{1}{2}$	36	15	38	4	4	2	Piedmont..	.95
Clinton.....	$\frac{1}{2}$	18	80	$1\frac{1}{2}$				Coastal...	1.00
Fayetteville.....		82	16	2				....do....	.875
Gastonia.....	$1\frac{1}{2}$	3	7	36	30	8	14	Piedmont..	1.06
Goldsboro.....	1	65	30	$3\frac{1}{2}$	$\frac{1}{2}$			Coastal...	.91
Jacksonville.....		26	$45\frac{1}{2}$	26	$2\frac{1}{2}$			....do....	.94
Kings Mountain.....		1	2	43	50	2	1	Piedmont..	1.03
Kinston.....	2	21	35	37	3	$1\frac{1}{2}$		Coastal...	.95
Laurinburg.....		27	59	14				....do....	.94
Louisburg.....	$1\frac{1}{2}$	39	58	1		$\frac{1}{2}$		Piedmont..	.94
Nashville.....	5	86	$7\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$		$\frac{1}{2}$	Coastal...	.875
New Bern.....	$\frac{1}{2}$	3	5	33	50	8	$\frac{1}{2}$	....do....	.97
Raleigh.....		42	48	10				Piedmont..	.94
Red Springs.....		71	$28\frac{1}{2}$	$\frac{1}{2}$				Coastal...	.875
Salisbury.....	$\frac{1}{2}$	30	$62\frac{1}{2}$	$7\frac{1}{2}$	$\frac{1}{2}$			Piedmont..	.94
Scotland Neck.....	22	70	$7\frac{1}{2}$				$\frac{1}{2}$	Coastal...	.875
Selma.....	2	35	50	13				....do....	.94
Statesville.....		1	16	28	52	3		Piedmont..	1.03
Tarboro.....	5	80	12	2		1		Coastal...	.88
Wadesboro.....		1	7	60	31	$\frac{1}{2}$	$\frac{1}{2}$	Piedmont..	1.00
Washington.....		31	33	32	3			Coastal...	.94
Wilson.....		27	9	62	$1\frac{1}{2}$	$\frac{1}{2}$		....do....	.97

Total number of bales stapled for all of the above towns, 25,020.

RECEIPTS AND DISBURSEMENTS OF THE STATE WAREHOUSE SYSTEM

RECEIPTS

1919						
Dec. 13	By N. C. Corporation Commission..	\$80,000.00				
1920						
Jan. 8	" " " " " "	51,714.27				
Feb. 14	" " " " " "	46,624.69				
Apr. 13	" " " " " "	13,000.00				
May 14	" " " " " "	9,000.00				
July 12	" " " " " "	2,143.61				
Nov. 3	" " " " " "	10,000.00				
Nov. 8	" " " " " "	5,000.00				
Nov. 23	" " " " " "	1,000.00				
Dec. 11	" " " " " "	40,000.00				
					\$258,482.57	
1920						
Jan. 8	By interest on N. C. bonds.....	\$ 800.00				
July 3	" " " " " "	1,980.00				
Nov. 16	" " " " " "	42.50				
					2,822.50	
						\$261,305.07

DISBURSEMENTS

BONDS PURCHASED

1919						
Dec. 13	To N. C. Bonds.....	\$40,000.00				
1920						
Jan. 9	" " " " " "	26,000.00				
Feb. 17	" " " " " "	33,000.00				
Aug. 21	" " " " " "	1,713.96				
Nov.	" " " " " "	6,000.00				
					\$106,713.96	

WAREHOUSE LOANS

1920						
Aug. 6	To Sampson County.....	\$15,000.00				
Sept. 4	To Kenly.....	17,500.00				
Sept. 8	To Union County.....	25,000.00				
Sept. 25	To Cumberland County.....	24,000.00				
Nov. 1	To Johnston County.....	35,000.00				
Dec. 11	To Moncure.....	1,500.00				
					\$118,000.00	
1919						
Dec. 13	To accrued interest paid on N. C. Bonds				720.13	
1920						
Dec. 14	To balance (\$12,292.47-\$23,578.51) .				35,870.98	
						\$261,305.07

Number bales of cotton reported ginned.....	857,253	
Number bales of cotton collected for.....	834,000	
Number bales of cotton not collected for.....	23,352	

REPORT OF ANALYTICAL DIVISION

To the COMMISSIONER OF AGRICULTURE

SIR:—In the two year period just passed (December 1, 1918, to November 30, 1920) I was State Chemist to September 1, 1919, and Dr. J. K. Plummer from that date to July 1, 1920, when he resigned. Since that time I have given advisory assistance where needed, and am bringing together, by agreement, this report for the period.

CHEMICAL WORK

The amount and kind of chemical work done in the laboratory during the two years is given in the following summary of analyses made in that time:

Official samples of fertilizers.....	2,250
Fertilizers and fertilizer materials for farmers.....	850
Cotton seed meal.....	575
Limes, Limestones and Marls.....	200
Concentrated Stock Feeds	1,375
Soils	500
Mineral Waters	60
Poison Cases (Animals).....	15
Miscellaneous	50
Total	6,175

There have been a number of changes in the workers in the laboratory caused by the conditions of the times. The analyses of fertilizers and the various fertilizer materials, feeds, cotton seed meal, soils, limestones, and miscellaneous products, mostly of an agricultural nature, have been made in the usual way and with very satisfactory results, the results having been published at the usual times in the bulletin of the department, and in such a way as to carry the information they contained to the farmers of the State in a timely way and in useful form.

Borax.—The one outstanding matter in the fertilizer control work which has given much trouble was the presence of borax in a rather small number of brands of fertilizers sold in the State. This borax gained entrance into fertilizers through the use by a very small number of manufacturers of potash material from Searles Lake, in California, and its use was without our knowledge or consent, and we did not have knowledge of the use of any material containing borax as this product did until after the fertilizer had been sold and used on crops. We have been asked by a number of manufacturers as to the advisability of using potash materials carrying some borax, and to be on the safe side we have always advised against its use. Every possible help has

been given by the department and the workers of the Experiment Station and Extension Service to the farmers who have had trouble from the use of fertilizer containing borax or suspected of containing it, and much time has been spent in collecting information as to the effect of borax on different crops and soils for our information and guidance in the future. This is the first time that we have had any trouble of this kind, and the lack of satisfactory methods for the determination of borax in mixed fertilizers have been a hindrance to dealing with the matter. Much time has been given, and is still being given by ourselves and others, to the development of a satisfactory method for the determination of borax, as all, or practically all, of the states from Maine to Texas have had experience similar to our own. We feel that such action has been taken by the department as will prevent any recurrence of our experience. A series of experiments were conducted by Dr. Plummer, in coöperation with Dr. Wolf, to determine the effect of borax on crops when used in different amounts and on different soils. These results have been published in the October, 1920, bulletin of the department.

Soil Survey.—Analyses, both chemical and microscopical, have been continued in the laboratory on samples of soil collected in the soil survey work, as well as those sent in by farmers and others, for analysis and information. The counties of Tyrrell, Durham, Buncombe, Guilford, Vance, and Moore have had soil surveys made of them in this period. These soil analyses are published from time to time as counties, or areas, are finished.

The other analyses of fertilizers, feeds, and similar products have been published at regular periods in the bulletins of the department.

Very truly yours,

B. W. KILGORE.

REPORT OF DIRECTOR OF EXPERIMENTAL AND EXTENSION WORK IN AGRICULTURE

To the COMMISSIONER OF AGRICULTURE.

SIR:—A yearly report in considerable detail has been presented to the Joint Committee for Agricultural Work and to the Board of Agriculture and the Trustees of the College of Agriculture covering the work of the Agricultural Experiment Station and Agricultural Extension Service. This work is under the control of the Joint Committee for Agricultural Work and is conducted coöperatively by the State Department of Agriculture, the State College of Agriculture and Engineering and the United States Department of Agriculture, these institutions combining workers, means and plans in one undertaking for service to the farm and the farm home. It is not necessary to repeat these reports here as they are published annually, but it is felt that a summary will be timely and useful.

1. *Agricultural Extension Service.*—Some idea of the extent of the service rendered by the Agricultural Extension Service is shown by the following summary for the year just passed:

During the year 19,365 demonstrations were conducted in the growing of field crops, and 76,386 demonstrations in raising and handling livestock. There were 7,828 orchard demonstrations given, covering a total of 605,857 trees, most of these in home orchards. Two hundred and sixty-one community clubs were organized through the joint efforts of farm and home demonstration agents, with a total membership of 12,975. In addition to these clubs, there were 39,727 members of local clubs organized among women, boys and girls for raising crops, poultry and pigs, and for canning, preserving food and studying home problems.

Coöperative marketing organizations to the number of 100 were reported doing a business of \$1,111,851 during the year. County agents rendered 71,049 services to individuals and local organizations in handling fertilizers, manure and lime, including buying and selling and the proper use of these on the farm. 30,117 bales of cotton were classed by specialists during the year.

Construction work in which agents assisted included the building of 44 dipping vats, in which 29,475 cattle were dipped for the control of ticks; 100 silos; 4,489 farm buildings erected or improved, and 300 potato storage houses planned for individuals and organizations.

Through the efforts of agents 775 farm water systems were installed; 2,524 lighting systems, and 5,402 rural telephones. Home grounds were improved on 5,914 farms, and 25,730 separate services were ren-

dered in improving sanitary conditions. There were 295 drainage systems installed, covering 2,291 acres that were tiled, and 19,625 acres ditched. Terraces were laid out on 2,563 farms, embracing an acreage of 37,294.

New home gardens to the number of 26,217 were started; 33,500 bushels of good seed secured; 327 farm wood lots improved; 9,177 sugar plant demonstrations made; assistance given in choosing, buying and operating 25,263 farm implements; and farm management surveys were made and plans furnished to 374 individuals or communities.

In carrying on their work, the extension force made 120,651 visits; traveled 961,173 miles; held or addressed 22,613 meetings with a total attendance of 1,073,874; wrote 376,068 letters; published 4,893 articles in the press; mailed 342,086 bulletins and 563,190 circular letters. There are now 65,000 names on the mailing lists.

There were 89,793 individual calls made on county agents; 275 agricultural fairs held; 449,000 bulletins printed, and 488 volumes added to the library.

Home conveniences to the number of 5,816 were installed in farm homes; 1,719,022 containers of fruits and vegetables filled by club members; 45,051 pounds of products brined, and 61,646 pounds of fruits and vegetables dried.

The above covers briefly the activities of the farm and home demonstration agents and boys' and girls' clubs for white and negro people, and the work of the several subject matter divisions in Agronomy, Animal Industry, Entomology, Horticulture, Plant Diseases, Animal Diseases, Farm Engineering, Fairs, Farm Forestry and Markets, and Rural Organizations. Separate reports are being submitted covering the work of these several groups in detail.

2. *Agricultural Experiment Station.*—The Agricultural Experiment Station deals with the work of investigation, or the finding of new facts for the benefit of the farming interests of the State. These investigations are conducted in the laboratories of the College and the Department of Agriculture and on the Central Station, located at Raleigh, and the Branch Experiment Stations, or Test Farms—six in number—located on the different main type soils of the State for the purpose of studying soil, crop and other conditions especially applicable to those sections of the State in crop and animal production.

Central Station, at Raleigh.—This farm is used mainly for work with farm crops and soils, animal industry and horticultural investigations. Some of the more general questions are dealt with on this farm, leaving the problems which have local application or flavor to be handled on the branch stations.

Edgecombe Farm.—This farm is being more largely devoted than formerly to animal industry work, especially with hogs in the study of the questions relating to pork production with peanuts, soy beans, and other

eastern grain and grazing crops. Beef cattle feeding work and some grazing is also done on this farm. Fertilizer and soil improvement work with the main farm crops of the section—cotton, corn and peanuts—are being continued here, as well as variety testing and breeding tests with these crops.

The main interest of the Horticultural Division on this farm is in the pecan variety orchard, which has now come into good bearing, and the results are showing what kinds are adapted to that section of the State.

Black Land Farm.—This farm is located at Wenona, in Washington county, on the Norfolk Southern Railway, between Belhaven and Roper, on a typical area of the black land of the eastern part of the State. There are large areas of this kind of land in the State, and our largest developments in the last few years have likely been on these lands. Large areas have been drained and brought into cultivation, and have, and are, attracting many settlers from outside the State. This farm is being used to study drainage questions relating to the soil in the way of tile and open drains to determine the amount and character suited to the soil, and to the crops which will grow best on this soil, and the treatments in the way of liming and fertilizing and handling which will make it yield most profitable results, as well as take care of its fertility for the future. The work on this farm is being more and more needed and used than ever because of the development and the bringing to the section of new people not familiar with these lands and North Carolina farming conditions.

The main crops being grown and worked with at present are corn, soy beans, cowpeas, oats, potatoes, and grasses.

Pender Farm.—The main purpose of this farm is to conduct investigations with horticultural crops, including both vegetables and fruits, and to do some work with the general farm crops of the section and with livestock. Special work is being carried on with Irish and sweet potatoes to determine varieties best suited for the section and methods of curing and storing sweet potatoes and the development of the best kind of house for this purpose.

A seasonable vegetable garden is maintained to determine kinds and varieties of vegetables which can best be grown at different times and with the view of having a year-round garden for the home and for marketing purposes.

A rather large planting of varieties of peaches have been put out for breeding purposes with the view of producing a kind which will bloom at a time to be reasonably safe from frost and yet have good quality for home use and for shipping. Strawberries are being worked with from the standpoint of varieties, fertilization, cultivation, and handling, and the variety pecan orchard has already reached the point of giving valuable results and showing the kinds which are best suited to that section of the State.

Perhaps the outstanding piece of work on this farm is the muscadine, or scuppernong, grape vineyard handled jointly with the United States Department of Agriculture. All of the leading varieties of this type of grape have been planted on this farm, new kinds are being developed, methods of pruning and training are being studied, and special attention is given to the utilization of the grapes by the production of various products in the way of grape juice, jelly, butter, paste marmalade, etc., and a market established for these.

Field crop work with fertilizers and soil fertility experiments are being conducted with cotton, corn and soil improvement crops.

One of the outstanding herds of Jersey cattle in the State has been developed on this farm, as is shown by the following records for the past season:

(a)	Average pounds of milk produced by whole herd this year	6,822.2 lbs
(b)	Average pounds fat produced by whole herd this year....	345.6 lbs
(c)	Seventeen cows have been admitted to advanced registry	
(d)	Pender, Eminent Lass E:	
	Milk	10,742.5 lbs.
	Fat	564.66 lbs.
This is State record for Junior 4-year old.		
(e)	Pender Eminent Lass J: (six months only—got sick)	
	Milk	7,233.4 lbs.
	Fat	387.5 lbs.

This is State record as far as it went for Senior 3-year olds.

Use is being made of this farm by the people of the section, and the annual gathering of farmers is now looked forward to and is quite large. Much additional improvement is needed to take care of the work on this farm for the section.

Granville Farm, or Tobacco Branch Station.—This farm was established especially for the benefit of the tobacco industry, and a large amount of carefully planned experimental work with tobacco, corn, the grains and grasses is in progress, and the results already obtained, especially with tobacco, are interesting and valuable and are having their effect on the tobacco industry of the section. The farm has many visitors, and representatives of the various fertilizer manufacturers have met at the farm to study the question of fertilization of tobacco, and the results obtained will likely have much influence on the grade of fertilizer which is put out for tobacco for the section. The farm could not have a more important practical bearing than to determine the kind of fertilizer best suited for tobacco, and then for the manufacturers to put this kind of fertilizer on the market.

This is the only station of its kind in the country and is conducted in coöperation with the tobacco workers of the United States Department of Agriculture. Recently a laboratory has been built for special technical investigations of the Federal Department of Agriculture

workers and our own, as it was found necessary to have such a laboratory and equipment where investigations could be conducted in immediate touch with the growing crop.

The work being done on the farm in addition to the strictly investigational work has in mind the development of a system of farming which will produce other crops than tobacco and develop the best system of agriculture for the section.

Iredell Farm.—This is one of our oldest and best equipped farms and is located near Statesville, in Iredell county, for the purpose of doing work on the soil crop and animal problems of the Piedmont area. The tests with corn, the grains, grasses and cotton to determine their fertilization or plant food requirements on Piedmont soil, the testing of varieties of these crops, and their improvement by selection and breeding, have been in progress for a number of years and much definite valuable information has already been obtained and is being generally used in the section.

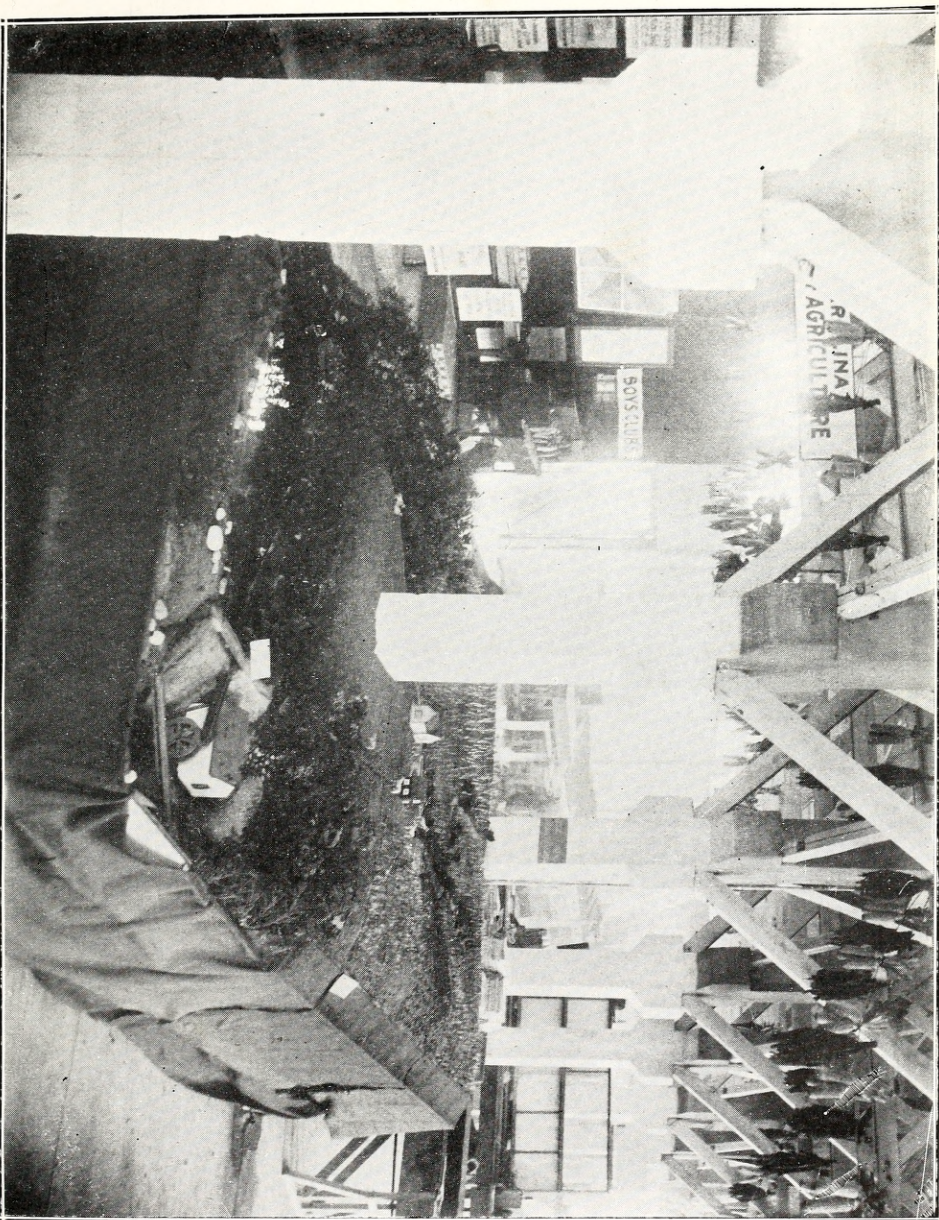
Horticultural work with fruits, apples, peaches, pears, cherries, etc., in the way of determining varieties, methods of cultivation, pruning, spraying, and handling, has proven its worth, and the orchards and these fruits are most attractive and instructive. The livestock work is confined mainly to hogs and sheep.

This farm has become a gathering, or picnic ground for the farmers of the county and section, the attendance on the main gathering being usually 3,000 to 5,000, and a considerable number of smaller meetings are held there every year for the purpose of recreation and pleasure and for seeing the work on the farm. These meetings are encouraged as they are one of the best means of getting the results of our work put into practice.

Buncombe Farm.—This is a most attractive place and is well located on the main hard-surface highway between Black Mountain and Asheville, and about two and one-half miles from Black Mountain. This is a grain, grass, stock and fruit section, and the farm is being conducted especially to help develop these industries along with the other crops which are more generally grown, especially Irish potatoes, cabbage, vegetables, and soil improving crops. Tests to determine the fertilizer needs, along with soil improvement crops, varieties and the improvement of varieties by breeding and selection are being carried on with field crops, and the orchard work with apples and peaches cover varieties, pruning and spraying and methods of handling the fruit. Plans have been made for adding to the livestock work on the farm.

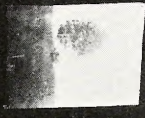
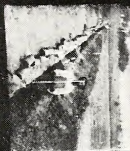
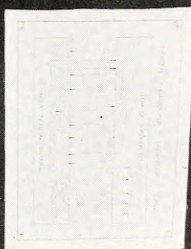
The attached statement shows the receipts and expenditures on the several test farms during the past year, individually and as a whole. The expenditures cover operations and improvements.

The estimates also attached are for operations and for needed improvements. Under present conditions it will take all of the amount, I feel, under estimates to conduct the farms during the coming year.



A MODEL FARM EXHIBITED IN AGRICULTURAL BUILDING AT THE STATE FAIR, 1920

TERRACE YOUR LAND



ASSOCIATION

Hold your Cotton
and
Cotton Seed
Tight
Save the Seed
Don't let it go
Don't let it go
Don't let it go

11. 1840
 12. 1841
 13. 1842

RECEIVED

RECEIVED

RECEIVED

NORTH CAROLINIANS
 Are
MAKING COTTON
ANSWERS
 to our needs for
 1. Land Power
 2. Labor Power
 3. Better Business
 4. Greater World Credit
 5. 50% to make the most
 of our resources
AMERICAN

OS 6451
What For?
To keep a record of
your
Planned and Actual
Results and Expenses
(Useful to business owners
or managers of small firms
and other business firms)

ORGANIZE
 OFFICE MATERIALS
 The creation of the
 Great 35 Project
 The 35 Project
 American Union Book
 to back of the
 State University
 of New York



Labor is likely to be less expensive, but what we have to sell would also go for less, and these, to an extent at least, will balance each other. I think it will be impossible, and I do not expect appropriations to meet the needs for improvements, but there should be done what is possible to bring this about gradually, with the understanding, of course, that should there be any excess on the farms for operations, this would be devoted to improvements.

<i>Farm</i>	<i>Expenditures</i>	<i>Receipts</i>	<i>Difference</i>
Buncombe	\$ 9,044.12	\$ 2,863.39	\$ 6,180.73
Pender	22,678.52	15,668.90	7,009.62
Edgecombe	15,066.17	5,460.38	9,605.79
Iredell	11,919.08	3,872.44	8,046.64
Granville	14,872.02	5,997.52	8,874.50
Washington	5,949.75	1,425.45	4,524.30
Total	\$79,529.66	\$35,288.08	\$44,241.58

<i>Operations</i>		<i>For Improvements</i>	
Buncombe	\$ 6,000.00	\$ 1,000.00	to finish barn for cattle
		2,000.00	for house for labor
Pender	8,000.00	2,000.00	for house for dairyman
		1,000.00	for shed for cattle
		2,000.00	for two houses for labor
		3,000.00	for utilization house and equip-
			ment for grape work
Edgecombe	6,000.00	5,000.00	for lighting system, repair of
			superintendent's house, office
			building, seed house, etc., and
			operations
Iredell	6,000.00	2,000.00	for house for labor
Granville	6,000.00	1,000.00	for tool shed
Washington	5,000.00	1,500.00	for tile for newly cleared land
Total	\$37,000.00	\$20,500.00	

These farms, or branch stations, are the field laboratories on which the various workers of our State and Federal institutions conduct their investigations, and now that we have a large force of extension workers to carry new facts and things to the farm and farm home, it is more important than ever that we maintain good, well-equipped plants for investigation and a strong force of workers in agriculture who are all the time working to find new facts which will make a better farming industry or to meet difficulties which may arise from year to year. For these reasons these farms should be given the best equipment possible and our workers opportunity for conducting their investigations on them.

Respectfully submitted,

B. W. KILGORE, *Director*.

REPORT OF THE CURATOR OF THE MUSEUM

To the COMMISSIONER OF AGRICULTURE.

SIR:—I beg to submit herewith my report as Curator of the Museum for the year now closing.

General.—During the early part of the year we were still confronted with the likelihood of moving at almost any time, and for that reason no collecting trips after specimens and material have been undertaken. In many respects it would be more satisfactory to know that the old building would stay in place than to be eternally faced with such uncertain conditions.

In September I made an official trip to Wilmington and thereby secured the skin of a manatee, or sea cow, that had been caught in fisherman's nets in Masonboro Sound. This is our first State record of this rare animal, which is now found only in southern Florida, and is not plentiful even there. The skin will be prepared and mounted at the earliest opportunity.

The specimen was donated to the Museum by the Howard and Wells Amusement Company, of Wilmington.

The collections have been kept in good shape and the exhibition rooms clean and attractive. Some of the collections have been re-arranged, and the usual amount of repair and renovation work and of re-labelling has been carried out.

The office work has been properly handled and the correspondence attended to, the latter of the usual diverse character. Replies have been made and remedies suggested to various enquirers on depredations by birds and animals, particularly rats; on matters connected with the game laws; on fish breeding, and on a multiplicity of other matters.

Specimens—both mineral and zoological—have been examined and identified for people all over the State, some submitted personally and others by mail.

Exhibits.—As a great deal of matter has been appearing in the press of the country regarding the destructiveness and the disease-carrying habits of the house rat, the Museum prepared an exhibit covering this matter. This was first shown at the State Farmer's Convention and, later, in the department's exhibit at the State Fair.

At the State Fair the general oversight of the department's exhibit was mainly in the hands of the curator. The following divisions and associated lines of work participated: Animal Industry, Crop Reporting, Plant Diseases, Farm Management, Cotton Association, Drainage, Marketing, Entomology, Botany, Boys' Corn Clubs, and Museum, together with a general exhibit by the department. At least three members of the board saw the exhibit and I believe they will agree with me

in saying that it was a very creditable display. Several new features were introduced and the exhibits in general were well demonstrated by the divisions making them.

Assistant Curator.—Last June Mr. W. W. Eagle, assistant curator, left us to continue his medical studies, and Mr. Harry T. Davis, of Carteret County, was appointed in his place.

Mr. Davis is a graduate of the State University, of the class of 1919, and he took his master's degree this year. He is a trained geologist and mineralogist, and all correspondence to the department relating to geology, and all mineral specimens submitted for identification, are now referred to him. The acquisition of a practical geologist is a valuable addition to the department's force and I am requesting that Mr. Davis' salary be increased from \$1,700 to \$1,900. He is a good, all-round man and he deserves the increase requested.

State Fair of 1920.—There is a very vital question regarding the agricultural exhibits at the State Fair that I think should be called to the attention of the board, and this is the small number of, and the restricted space allotted to such exhibits. The fair seems to depend mainly on the Department of Agriculture for representing the agricultural activities of the State, and collective agricultural exhibits by farmers and counties are mainly noticeable by their absence. At the fair of 1920 I counted but six collective exhibits by counties and individual farmers—and this is called the State Fair and is supposed to be operated in the interests of the agriculture of the State.

One of the reasons for this state of affairs is the inadequacy and character of the exhibit space. Such exhibits have to be shown in an old, badly-lighted, dilapidated building that should have been wrecked years ago.

This year these agricultural exhibits were not even bunched, being divided into groups by the booths of glass-jewelry fakirs and other concessions set in between.

The interior of this building is so unsightly that an exhibitor is confronted with an expense which he should not have to meet to make his exhibit comparatively presentable and attractive—and then he is confronted with a very poor light and unattractive surroundings.

The competitive exhibits of individual crops, such as corn, cotton, tobacco, wheat, oats, etc., seem to lessen in number almost yearly, and it will not be long—at the present rate—before the department will be almost the only agricultural exhibitor left.

Then, for those who wish to see the races—and they are many—there is no grand stand. A small, temporary make-shift was installed this year, but it was nothing more.

The past fair was pretty much dominated by the side shows and fakirs; I do not think I ever saw so many in an equal space.

I do not wish to appear narrow-minded in this matter, and I see no reason why horse-racing, free attractions, and amusement features

for which a charge is made, should not be permitted within reasonable limits. But I do think that agriculture should be the main effort in a so-called agricultural fair.

The attendance at the recent State Fair has been written up as a record-breaker. But how many farmers visited the fair and went home better-informed men—outside of such information as they secured from the department's exhibit and from the livestock display?

The above conditions are not by any means entirely chargeable against the management of the fair. The State Agricultural Society hasn't the money, nor is it able—as I have been given to understand—to secure the money to place the State Fair on an effective modern basis. In my opinion patching and adding a new building or two every few years will never attain the result desired. The trouble goes deeper. If it is ever to be a really representative State Fair it should not be hampered by the necessity of selling space to an unlimited number of fakirs to secure funds for a new building or for patching the old buildings.

County and community and other local fairs are now being conducted all over the State and I have understood that at some of them the exhibits of farm crops are superior to those shown here.

All the large exhibitors of farm crops of a few years ago have ceased to exhibit at Raleigh, and one of them, from west of Asheville, was awarded the first premium at the Atlanta fair last year. This year the same man is exhibiting in Canada, having ceased exhibiting in North Carolina. Such facts speak for themselves.

I called attention to this matter in a somewhat general way in my report of a year ago.

Appropriations.—The appropriations requested on Museum account are shown in detail on the attached budget estimates. Only two small increases are asked. That for an addition to Mr. Davis' salary is explained in a previous paragraph, and the other—two hundred dollars—is for additional laboratory equipment for use in the study and identification of minerals. We have started a small laboratory along this line and an additional expenditure of about two hundred dollars will afford us all the equipment we need at the present time.

Respectfully submitted,

H. H. BRIMLEY, *Curator, State Museum.*

REPORT OF THE STATE VETERINARIAN

To the COMMISSIONER OF AGRICULTURE.

SIR:—I have the honor to transmit herewith the biennial report of the Veterinary Division covering the period from December 1, 1918, to December 1, 1920.

TICK ERADICATION

Tick eradication has advanced as rapidly as possible under present conditions. There are, at this time, 22 counties under Federal and State quarantine and during the year we have conducted work in 12 other counties which have been previously released from quarantine but in which more or less infestation was found. Pasquotank County will be released from State and Federal quarantine December 1, 1920.

The boards of county commissioners of Beaufort, Bertie, Chowan, Onslow, Pasquotank, Pitt, and Martin counties agreed to adopt systematic tick eradication in coöperation with this office and the United States Bureau of Animal Industry. In the remaining quarantine counties we have done extensive preliminary and educational work. Martin, Columbus, Craven, and Brunswick have previously conducted systematic work but their respective boards of county commissioners saw fit to suspend the work and it was, of course, impossible for us to continue.

During 1919 there were 245 vats constructed and 98 during 1920. For the past six months it has practically been impossible to secure cement. There are, at this time, 806 vats, all of the quarantine counties (with the exception of Gates) having vats ranging anywhere from 3 to 97 each. There were, during this year, 40 vats dynamited, 19 of which were rebuilt. One vat was dynamited in Pitt County and, as it was impossible to replace same at once, it was necessary to spray the cattle on the next dip day. At this time two Federal inspectors were shot by unknown parties, several large shot taking effect in each, though not seriously injuring them. Subsequent sprayings were done under guards furnished by the sheriff and no further trouble developed.

From November 1, 1919, to November 1, 1920, there were 40,943 herds of 168,602 cattle dipped as compared with 15,514 herds of 54,203 cattle during 1919. Our plan of work this year has been similar to that employed last year. That is, meeting with the respective boards of county commissioners and discussing tick eradication as a business proposition and soliciting their coöperation. This necessarily requires that each board be visited several times before the work is adopted. This seems to be the best we can do under present laws, for it is absolutely essential to secure the moral and financial support of the board before systematic work can be undertaken.

Of the seven counties in which systematic work was begun during the year (upon our being assured by the Board of County Commissioners that they would coöperate) two of the counties suspended work and it was necessary to partially suspend work in several others to prevent it being stopped altogether. Our present State law, according to the opinion of many leading lawyers, gives us full authority to quarantine but not to compel one to dip cattle. Tick eradication can never be accomplished unless we have the authority to compel dipping, for without this, a few men who refuse to dip will prevent us from freeing a county. There have been 55 counties free of ticks up to this time, but unfortunately the question of tick eradication has become a political issue in many of the remaining 22 infested counties, although we constantly endeavor to keep this work on a business basis and never inject politics. As matters now stand the work may be suspended any time by a board of county commissioners. In order to completely eradicate ticks from a county, it is necessary to dip all cattle every two weeks for a period of seven months. Should the commissioners decide to suspend work (as was done in several counties this year) at any time before dipping had been conducted seven months, it means that the time and money spent has been wasted so far as freeing the county is concerned. Every Southern State in which tick eradication is being conducted, except North Carolina and Florida, have a State-wide tick eradication law. In the State of Georgia, where tick eradication is conducted under a State law, work has been conducted this year in 30 counties, 18 of which have been entirely freed (and the State of Georgia didn't go Republican in the recent election either). This territory is very similar to the area we have under quarantine and the conditions met with are similar to ours. At the 1919 session of the General Assembly we had a State-wide tick eradication bill introduced. This bill was drawn along the lines of similar laws in other States, being modified to meet our conditions. Briefly, it requires the county commissioners of the quarantined counties to take up tick eradication in coöperation with this department and the U. S. Department of Agriculture and conduct same to completion. Further, it provided that all cattle should be dipped regularly. This bill did not pass and was again introduced at the extra session in August, 1920, and was killed for "political expediency" through efforts of the members from the quarantine counties. As it now stands the commissioners can take up the work if they desire and discontinue same at any time. A few men can appear before the board and bring sufficient pressure to bear to compel the members to discontinue work or be politically annihilated. This is a deplorable condition and one that I believe many boards would like to see changed. With a State-wide law the work would be taken up in all counties at once and continued, which would prevent our spending a large sum of money in a county and having the work discontinued after three or four months. We have dipped more cattle during this year than was

dipped in the three previous years, but through lack of proper laws, the dipping has not been complete and we have been unable to free counties, which is the object we have in view. The work progressed very satisfactorily in Pasquotank County, but U. S. District Attorney Aydlott, of Elizabeth City, caused to be introduced in the extra session of the Legislature a bill to prevent our working in that county. This bill was defeated but the fight was continued in the county in an effort to induce the county commissioners to abandon the work, but they saw the folly of this and the work is proceeding satisfactorily and arrangements have been made to release the county from State and Federal quarantine on December 1, 1920.

The quarantine line reaching across the eastern part of the State from Virginia to South Carolina is expensive to maintain and a large part of our funds have been spent for this during this year. It is necessary to maintain this or the ticks will soon spread back to the free counties. In view of the serious situation which now confronts us, I hope that the board will see fit to take a personal interest in this matter and urge upon the incoming legislature the importance of our having a State-wide tick eradication law which will enable us to quickly and economically get rid of the ticks.

We had a very creditable exhibit at the State Fair in connection with which we had frequent dipping of cattle in a vat which we constructed. The dipping was witnessed by a large number of people who had never seen cattle dipped, and enabled us to demonstrate that dipping is harmless and practical. A scrub cow, from a ticky range, was exhibited beside a high grade Holstein cow, owned by the Animal Industry Farm, demonstrating to a large number of people who saw the exhibit the importance of tick eradication as a business proposition.

HOG CHOLERA

We have worked in coöperation with the United States Bureau of Animal Industry following the plan previously adopted but confining our efforts more to quarantine and disinfection of premises where sick animals were found, thus preventing the further spread of disease. This phase of the work will be more generally used in the future. During the year our inspectors have quarantined 68 farms on account of cholera, returning later to advise and assist the owner in disinfecting the premises.

In addition to the work done under the coöperative plan, inspectors from this office answer many calls for assistance in outbreaks of cholera throughout the State and assist in controlling outbreaks. We realize the economic importance of controlling disease and we give every assistance possible in reported outbreaks, although it is impossible for us to answer all calls for assistance. We received only a limited number of calls outside of the eastern section of the State, as outbreaks in other sections are taken care of by the practicing veterinarians and are much

more easily controlled under stock law. There continues to be a lack of practicing veterinarians in the eastern section of the State which has made it necessary to continue having laymen use serum and virus for the prevention of cholera. This, it would seem, is the best we can do at this time, but it is far from being satisfactory. We have trained a number of new administrators, some of whom have taken up the work in new territory and others have taken the place of administrators who have given up the work for one reason or another. Our veterinary inspectors work with the administrators as frequently as possible in the field to give them additional instructions. But with all of the caution exercised, we have frequent reports of bad results following the use of serum and virus by laymen and it would seem impossible to train these men to satisfactorily administer serum and virus at all times. A thorough veterinary training is essential for the proper and satisfactory use of serum and virus. This would seem to be more important at this time as we are confronted with a possibility of other diseases affecting hogs, closely resembling hog cholera.

Our inspectors have visited a total of 4,309 farms for the purpose of diagnosing disease and immunizing swine and have treated a total of 44,816 hogs.

A large number of meetings have been held at which the use of serum as a preventive agent and the importance of sanitation have been fully explained. Such meetings have been held in those sections where cholera is prevalent and where the owners, for one reason or another, have not taken advantage of serum to prevent losses from cholera.

Special work was conducted during 1919 in Green and Lenoir counties, where the boards of commissioners appropriated money to assist with the work. All farms in these counties, on which cholera was found, were quarantined; the hogs treated and held until all indications of the disease had passed; and the lots, pens, etc., thoroughly disinfected. Much good was accomplished by this work but we feel that it is too expensive to undertake on a large scale.

The livestock sanitary laws and regulations which we now have covering the inter and intrastate movement of swine and the handling of sick animals have been closely followed and enforced. This has reduced outbreaks of cholera materially, as we previously experienced many outbreaks following the sale of a shipment of hogs.

We have recently published a bulletin dealing with hog cholera, which has been widely distributed.

SERUM PLANT

In my annual report last year I recommended that we produce just as much serum as could be economically done and not attempt to produce an amount sufficient to meet all our needs, as it would mean a large financial outlay with a subsequent opportunity for loss. To pro-

duce all the serum needed would require that the plant be operated at all times to full capacity. During certain seasons it is impossible to secure suitable hogs locally, and to purchase them at distant markets makes the cost prohibitive.

However, we did produce a large part of the serum used this year and produced it economically by the careful buying of hogs, reducing the expenses at the plant to a minimum and paying strict attention to details. The serum which we purchased was secured from a reputable concern and was frequently tested for potency to insure the purchasers securing a reliable product. We were allowed a sufficient margin on this to cover cost of handling.

On January 1, 1919, the price of serum was reduced to \$1.50 per hundred from \$1.75. On October 1, 1919, we were able to reduce the price of serum to \$1.25 per hundred and again on May 1, 1920, a further reduction was made to \$1.10.

From November 1, 1918, to November 1, 1919, we distributed 3,838,120 c.c serum and 89,443 c.c. of virus, an amount sufficient to immunize approximately 150,000 hogs weighing 100 pounds each. There were 2,257,814 c.c. more serum shipped during this period than the two preceding years. This was shipped to all parts of the State, but chiefly to the east by express or parcel post. The shipments range from 50 c.c. up. The serum receipts amounted to about \$125,000,000. We now have on hand a sufficient surplus to use as a working fund, which is important for the efficient and economical operations of the plant.

TUBERCULOSIS

A very satisfactory tuberculosis eradication campaign has been conducted throughout the State in coöperation with the United States Bureau of Animal Industry. Much more interest is being manifested as the work progresses. Owners of cattle, especially of pure bred cattle, are quick to realize the great economical importance of maintaining their herds free from tuberculosis. A similar campaign is being conducted in practically every other State. All herds which pass two successive tests without reactors are placed on the accredited herd list. There are, at this time, in the United States about 4,000 accredited herds. We have 163 accredited herds and 862 herds under supervision which are being regularly tested with a view of accrediting. Cattle may be purchased from such herds with the assurance of securing animals free from tuberculosis. This is of great value to those wishing to buy or sell cattle.

As a result of the great amount of work done, tuberculosis and its eradication is more thoroughly understood. Tests have likewise been improved and, as a result of combination tests, the disease has been eradicated from badly infected herds.

The General Assembly of 1919 enacted a law providing for the payment of indemnities for cattle killed on account of being affected with tuberculosis. The sum of \$5,000.00 was annually appropriated and the claims are paid by the State Treasurer on a bill approved by this office. This law became effective February 21, 1919, and since that time we have paid \$9,745.89 indemnities on 344 animals slaughtered. A full report giving name and address of owners, together with amount paid, is shown in the annual report of the State Auditor. The law provides that we pay one-third of the difference between the appraised value of the animal and the salvage, not to exceed \$25.00 for grade and \$50.00 for pure bred animals. An equal amount is paid by the Federal Government. This work has been greatly stimulated, partly by the indemnities paid and partly by cattle owners realizing the importance of maintaining healthy herds.

We test regularly all of the herds owned by State Institutions, Test Farms, and A. & E. College. We have also tested all cows supplying milk to the principal cities and towns of the State, thus assuring a milk supply from cows free from tuberculosis. This part of the work has so greatly increased recently that we were unable to take care of it with our limited force. We, therefore, adopted the policy of having the local health department continue the work as started and thus allow us to confine our efforts more to the strictly rural districts and the testing of pure bred herds. This, we believe, will be of the greatest benefit in stimulating the pure bred cattle industry.

Applications for tests are becoming more and more numerous and we have, at this time, sufficient testing engaged to keep our inspectors going for the next several months without receiving any new applications. I feel that it is important that an effort be made to eradicate tuberculosis from a definite area, using the county as the unit. When such an area has been freed a new area will be taken up and so on. Such a plan must be adopted if we ever hope to entirely eradicate the disease.

INVESTIGATIONS

Inspectors from this office have answered about the usual number of calls for assistance to investigate reports of disease in every section of the State. A special effort has been made to avoid making useless trips which have now been reduced to a minimum. Our inspectors have judged the livestock exhibited at a number of county and other fairs. We have also done the veterinary work for most of the State Institutions, test and experiment farms.

Forage Poisoning.—Investigation has shown a few animals affected with forage poisoning, although this trouble, which is caused by ingesting moldy feed, has not been so prevalent as in some previous years. Information regarding the cause and prevention has been freely given.

Anthrax.—Several cases of reported anthrax were investigated and found to be some other trouble. One case was diagnosed by laboratory examination. All exposed animals were immunized and no further trouble was experienced.

Hemorrhagic Septecemia.—In addition to the cases of this disease found in the mountainous counties, our inspectors have found a number of animals affected with this disease upon investigation in other parts of the State. By the prompt use of vaccine same was satisfactorily controlled.

Glanders.—Inspectors from this office have tested a number of horses and mules for glanders. Eight reacted to the test, indicating the presence of glanders. They were all slaughtered and a post mortem examination confirmed the diagnosis. These animals were burned and the premises thoroughly disinfected and, in no case, did the infection spread to other animals. An act was passed by the General Assembly on February 21, 1919, providing indemnities for cattle slaughtered on account of being affected with tuberculosis and for horses and mules killed on account of being affected with glanders; payment for glandered horses and mules to be one-half of the appraised value, not to exceed \$100.00. Since the passage of this act we have paid indemnity on two animals, \$187.50. Indemnities were not paid on several animals as they did not come within the law. We believe that this law will be of great assistance in controlling this disease for the reason that owners of animals affected with glanders will report same to us in order to secure indemnity and will not sell the animals to avoid loss and thus spread the disease to healthy animals.

Black Leg.—A few cases of this disease have been found in sections where it was not usually prevalent. However, such cases have not been as numerous as previous years.

We have distributed 6,710 doses of black leg vaccine, together with information concerning its use. This was used in the western part of the State chiefly where, in many sections, it is necessary to immunize all susceptible animals to prevent loss from this disease.

Requests for investigations from the extreme western counties became so frequent and urgent during the past winter and spring, that it became necessary to give them some particular attention. Arrangements were, therefore, made to employ one of the college veterinarians during the vacation period and in addition to this a veterinarian from the Experiment Station was assigned to this work. These inspectors visited all of the western counties, spending about a week in each, which enabled them to visit most sections of the county. There are only a few practicing veterinarians in this territory, thus making it difficult for the owners to properly treat diseases of livestock and making it difficult for us to control outbreaks of contagious disease. Travel is slow and at times impossible in this territory during the winter and, while travel is fairly satisfactory during the summer, little or no

disease exists at that time. However, our inspectors were able to make a general survey and meet a large number of farmers who had suffered loss from disease among livestock, and the information gained will be of material assistance to us in the future. Every effort was made to enlighten the owners regarding the prevention of disease. Some of the more important diseases found to exist are given below:

Diarrhæa.—This seems to be a widespread disease existing in cattle and from our investigations is due, it would seem, to (1) internal parasites, (2) food, or (3) intestinal form of hemorrhagic septicemia, or a combination of these causes. The treatment of this condition, except in the early stages, is very unsatisfactory, but much can be done to prevent same and the information we have secured, as a result of our investigations, will materially assist us in handling this in the future.

Sheep Scab.—This disease was found to exist in Jackson and Transylvania counties and from the information we secured the disease was brought in by sheep purchased outside the State for breeding purposes. Sheep scab is transmissible and difficult to control and eradicate when the animals are at large on the range, as was the case in this instance. The sheep on a total of twenty farms were quarantined and arrangements made to dip same. An inspector was stationed in these counties during the month of October to supervise the dipping of the quarantined animals, which was conducted satisfactorily but not completed. The County Commissioners agreed to employ an inspector to complete the work. By close supervision of this situation, we hope to entirely eradicate this disease.

Hemorrhagic Septicemia.—This disease was found to exist to some extent in the mountainous counties and information regarding its prevention was given livestock owners.

Respectfully submitted,

WM. MOORE, *State Veterinarian*.

REPORT OF THE ANIMAL INDUSTRY DIVISION

To the COMMISSIONER OF AGRICULTURE:

SIR:

Heretofore I have, in my annual report, usually reviewed in more or less detail the outstanding phases of our livestock work. This year, however, I am merely giving statements of projects. If any member of the board desires additional information it will be little trouble for me to place it in his hands as practically all of our work is summarized up to date.

POULTRY EXPERIMENTS AND PATHOLOGY

B. F. KAUPP, in charge

Assisted by JNO. E. IVY, E. G. WARDEN

1.—“Digestive Coefficiency Studies.”

(The preliminary work of determining the time required for feed to pass through the intestinal tract of fowls at different ages and under different physical conditions, as for example a hen not laying, one sitting, one laying, young growing chicks. Some analytical work has been done. This work is still in progress at this time).

2.—“Mineral Nutritional Studies.”

(We have the mineral content of twenty Southern poultry feeds worked out, having from one to thirteen analyses of each feed.

We have the acid-base balance or potential alkalinity and potential acidity worked out for these twenty Southern poultry feeds.

We have two tests run on growing chicks, from baby chicks to twelve weeks of age, to determine mineral requirements for growth at this age.

We have definitely determined the mineral content of baby chicks, one and one-half pound broilers and of hens. Work is still in progress).

3.—“Breeding Studies in Egg Production”.

(a) With Single Comb White Leghorns.

(b) With Single Comb Rhode Island Reds.

(c) With Barred Plymouth Rocks.

(d) Facts or physical signs which indicate egg production.

(Six generations of breeding high fecundity males on low females. Work still in progress.)

4.—“Practical Feeding Studies.”

(a) Animal against vegetable proteins.

(b) Dry lot vs. range.

(c) Influence of velvet bean on growth and egg production. Same for cotton seed meal.

(d) Influence of light on egg production.

(e) Influence of straw lofts on egg production.

(a) This work is in its second year. Studies were made of comparative rate of growth. Getting the pullets into early laying. Influence on egg production for first year. Records in office, in annual report, and used in teaching and in articles. (b) In its sixth year at Iredell Test Farm and

just starting similar work at Pender Test Farm. (c) Velvet bean and pod influence on fattening birds run at West Raleigh plant, effect of same on chicks run at Iredell Test Farm. Influence of bean alone on fattening birds run at Central Plant, West Raleigh. Chick work at Iredell Test Farm 1920. (d) Influence of light on egg production run at West Raleigh plant. Now in progress. (e) Influence of straw lofts on temperature and egg production running now at West Raleigh plant).

5.—“Market Experiments”.

- (a) Fleshing broilers.
- (b) Shipping shrinkage experiments with broilers.
- (c) Egg shipping experiments.

(Considerable data has been amassed and tabulated and studied. Still in progress).

6.—“Influence of climatic conditions on egg production.”

(Still in progress.)

7.—“Studies of the Pathological Laboratory.”

- (a) Entero-hepatitis of turkeys.
- (b) Diarrhœas of adults.
- (c) Diarrhœas of chicks.
- (d) Other apparent contagious diseases.
- (e) Parasitic diseases.
- (f) Tumors, both malignant and benign.
- (g) Non contagious diseases.
- (h) Histological studies.
- (i) Physiological studies.
- (j) Anatomical studies.

(Progress made with all these. For the first time in the world's history we have written a complete anatomy of the domestic fowl and illustrated it. W. B. Saunders undertook the publication of it as the financing was a heavy problem. Same of diseases of poultry from a medical standpoint.)

8.—“Experimental Extension Poultry Work.”

(We furnished sixty sittings of eggs first year, and twenty sittings second year. Good results are being obtained and valuable plans are being worked out).

SWINE EXPERIMENTAL WORK

EARL HOSTETLER, in charge

1.—“Curing Meat”.

(Brine is most satisfactory for curing. Meat from hogs fed on soy beans and peanuts and then finished on corn does not shrink any more than hogs fed on corn and tankage or shorts).

2.—“Peanuts—the Kernel—for Fattening Hogs.”

(Work been under way one year only).

3.—“Permanent Pasture for Pigs.”

(Each acre of Bermuda saved \$9.03 worth of grain).

4.—“Cost of Raising Pigs to Weaning Time”.

(It cost \$4.67 to produce an average pig until weaned at ten weeks of age).

5.—“Salt for pigs”.

(So far we have not found salt to be poisonous).

6. “Mineral Mixture and Medications for Wormy and Unthrifty Pigs.”

(A mineral mixture—home made—and the National Hog Remedy were both very beneficial. No particular advantage in using patent preparations.)

7.—“Soy Beans and Peanuts for Fattening Hogs”.

(Where there is normal yield there is little difference in the amount of pork made per acre but the hogs eat the peanuts much quicker than the soy beans).

8.—“Hardening the Bodies of Hogs after Peanuts”.

(Work not been under way long enough for definite conclusions, except to say that the bodies can be hardened so they are completely acceptable).

9.—“Burr Clover Pastures for Pigs”.

(Burr clover pastures save just one-half the grain.)

10.—“Tankage versus Fish Meal as Protein Supplements for Fattening Hogs”.

(Fish meal is less palatable than tankage but gives slightly better and cheaper gains).

DAIRY EXPERIMENTAL WORK

STANLEY COMBS, in charge

1.—“Herd Development Work”.

(The first crop of heifers to mature shows an increased milk production of approximately 1,500 pounds per year over that of the dams as mature cows. Not all of these animals have come into milk to date. The indications are that milk production will be increased by the heifers that are now maturing).

2.—“Peanut Meal versus Cotton Seed Meal for Maturing Heifer Calves”.

(Have not had sufficient time to mature the oldest heifers).

3.—“Feeding for Milk Production”.

(Eleven mature cows showed an increase of 31,741.6 pounds of milk per year when fed a full ration composed of the same feed that they had received the year previous, at which time they received only a limited ration).

4.—“Home-Mixed versus Ready-Mixed Feeds for the Dairy”.

(To date one grain has been fed. This produced slightly less milk than our home-mixed ration and cost \$22 more per ton).

5.—“Cost of Milk Production”.

(Published in the N. C. Dept. of Agriculture Bulletin No. 266, March 1920, “A study of the Factors Involved in Producing Milk in North Carolina.”)

6.—“Cotton Seed Meal Feeding Work—Effect on Cows and Heifers in Reproduction.”

(In cooperation with Beef Cattle Office. To date the work has been of a preliminary nature. On January first the lot of 24 animals was divided into five lots, each receiving different rations.)

BEEF CATTLE AND SHEEP

R. S. CURTIS, in charge

Assisted by EARL HOSTETLER, F. T. PEDEN, GEORGE EVANS

I.—Experimental:

1.—“Milk Sickness, or Trembles.”

(Have shown that milk sickness or tremble is caused by weed commonly known as Rich Weed or White Snake Root.)

2.—“Effect of Cotton Seed Meal on Cows and Heifers in Reproduction.”

(In cooperation with Dairy Experimental Office. Have determined partial effects of cotton seed meal on health, reproduction and vision.)

3.—“Effect of Cotton Seed Meal on Reproductive Qualities of Sheep.”

(Have shown that sheep can eat approximately one pound of cotton seed meal per 100 pounds live weight without producing deleterious effects.)

4.—“Methods and Cost of Maintaining Breeding Ewes and Producing Lambs.”

(Have determined cost of producing lambs and practicability of using pastures for maintaining sheep.)

5.—“Wintering Beef Cattle in Western North Carolina.”

(Concluded six years work October 1, 1919. Two official bulletins from Department of Agriculture.)

6.—“Winter Fattening of Beef Cattle.”

(Have determined relative value of feeding various quantities of cotton seed meal under given conditions.)

7.—“Sheep Production in Western North Carolina.”

(Have determined that sheep can be grown profitably under Western North Carolina conditions. Main obstacles are poisonous weeds. Temporarily discontinued.)

II.—Extensions:

1.—“Introducing Pure-bred Sheep.”

(27 males and 238 females were established throughout the State.)

2.—“Sheep Sheering and Demonstration Schools.”

(54 such schools were held in coöperation with county agents with a total attendance of 1,003.)

3.—“Sheep Schools for County Agents.”

(Plans are laid to inaugurate this as soon as funds are available.)

4.—“Marketing Wool and Lambs.”

(In coöperation with Division of Markets, 15,000 pounds of wool were shipped to Elkin to be made into blankets. Evans graded it. The wool has netted the farmer from 50-55 cents a pound.)

5.—“Dog Control Law.”

(Only a few counties are using the law. Some changes should be made in the law.)

6.—“Miscellaneous Sheep Work.”

(Evans has done much miscellaneous work with the county agents. Under this head he visited 230 farmers and advised with them about sheep; attended 7 fairs with educational exhibits, etc.)

7.—“The Value of Permanent Pastures.”

(This work is done entirely with county agents and is confined largely to the mountain counties where the Haywood experiments apply.)

8.—“Herdsman's Short Schools.”

(The beef cattle and sheep schools were held together. See sheep schools for results.)

9.—“Introducing Pure-bred Beef Cattle.”

(As a result of this effort the Hereford and Aberdeen-Angus breeders have each organized and held sales. Sloss also assisted individuals in purchasing cattle.)

10.—“Marketing Beef Cattle.”

(In cooperation with Division of Markets, a large sale was held at Spruce Pine on September 23. 700 head were offered but all were not sold. Conditions interfered with plans but we feel that the cooperative plan outlined can be carried through successfully this fall.)

EXHIBIT SHOWING ^{1/2} FOOD VALUE ^{1/2} DAIRY PRODUCTS AS COMPARED WITH OTHER FOODS.

Is more Butter!
One pound of Butter is equal in value to half of many portions of **EGG**.

98% of the Butter
is made by the body of the cow. It is the best and richest.

Milk
all Foods
are made of Milk. It is the most perfect food for the body.

Is more Milk
One quart of Milk is equal in value to half of many portions of **EGG**.

Milk
is the most perfect food for the body. It is the most perfect food for the body.

Is more Cheese
One pound of Cheese is equal in value to half of many portions of **EGG**.

CHEESE
95% of the Cheese is made by the body of the cow. It is the best and richest.

WITH THE HIGH COST OF MEATS, WHY NOT EAT MORE DAIRY PRODUCTS?

POULTRY CLUBS

ALLEN G. OLIVER, in charge

This work is really looked upon as a single project, Mr. Oliver devoting practically all of his time to the young folks of North Carolina. He, of course, does all of his work through the county agent as the local leader. The total poultry club enrollment this year is 3,200. In looking after this membership Mr. Oliver traveled 15,217 miles, gave 132 talks—and talked to 13,413 people—made 608 personal visits, held 79 club meetings at schools, gave 428 poultry demonstrations of various kinds, and had his young people show at fairs 1,178 birds and 137 dozens of eggs, they winning almost a thousand dollars in prizes.

SWINE EXTENSION

W. W. SHAY, in charge

1.—“Pig Clubs.”

(The membership this year is 1,081. Shay has confined his club efforts this year largely to providing subject-matter material.)

2.—“Introducing Better Breeding Animals.”

(101 pure-bred hogs were placed by Shay personally and four public sales held. Most of this sort of work is now done through the county agent or the local representative.)

3.—“Swine Schools and Demonstrations.”

(This consists of butchering demonstrations, judging demonstrations, meat-cutting demonstrations, pasture grazing demonstrations, etc.)

4.—“Miscellaneous.”

(Much of Shay's time is taken up with calls which do not fit into program work, or writing letters—(1,601)—writing bulletins, making personal visits to farmers, (90), making talks, etc.)

DAIRY EXTENSION

JNO. A. AREY, in charge

Assisted by F. R. FARNHAM, D. R. NOLAND, A. C. KIMBREY, LEE COE, W. L. CLEVINGER, J. A. CONOVER

1.—“Creamery Development.”

(The creameries have enjoyed a successful year, having made 23.4 per cent more butter than last year. We have encouraged no new institutions: Clevenger has devoted his time to working with the old ones.)

2.—“Cheese Factory Development.”

(Even with some confusion prevailing as a result of low cheese prices and misinformation about cream stations the 30 cheese factories have enjoyed an output of 481,676 pounds during the year—a substantial increase over last year. Mr. J. A. Conover is now doing production work around the factories—work that has long been needed. Two new factories during year: would have been several more if we had not discouraged them.)

3.—“Register of Merit Work.”

(This work is all done under direction of Dairy Field Office. During May, for instance, 16 farmers with 107 cows were in this work, 22 cows during the month producing over 50 pounds of butter fat each.)

4.—“Cow Testing Associations.”

(Two cow testing associations are now actively at work, one around Asheville and the other at Charlotte. About 300 cows are involved.)

5.—“Dairy Cooperative Bull Associations.”

(There are now 9 such associations in the State, having a membership of 718 and owning 52 bulls.)

6.—“Construction Work.”

(a) Dairy field men assisted in the construction of 62 silos.

(b) Dairy field men assisted in the construction of 19 milk houses.

(c) Dairy field men assisted in the construction of 3 dairy barns.

7.—“Introducing Better Milk Animals and Family Cows.”

(During the year this office assisted farmers in bringing in 33 dairy bulls and 449 cows. This work appeals particularly to coastal section.)

8.—“Home Butter Making.”

(This work is done by means of women agents, the agents themselves being trained by our dairy experts. This office loans the women agents churning outfits for demonstrations before their farm women.)

9.—“Dairy Schools.”

(On account of the resignation of Reed and Brintnall this work suffered. 10 schools, however, were held by Kimrey and county agents with an attendance of over 500.)

ANIMAL NUTRITIONAL WORK

J. O. HALVERSON, in charge

1.—“A Study of ‘Soft Pork.’”

(Dr. Halverson has devoted much time since coming with us, April 1, getting acquainted with our conditions and problems. He now has hold of the “Soft Pork” problem and has outlined definite plans for continued investigation.)

2.—“Mineral Supplements, Chiefly Calcium, for Southern Animals.”

(This is a continuation, with modifications, of the work already under way.)

3.—“Nutritive Value of the Peanut.”

(This is a study really supplementary to the “Soft Pork” studies. The peanut is known to be high in protein and oil, but its nutritive value in other necessary growth constituents is not so well known. Halverson is conducting this study with young albino rats to determine the adequacy of (a) the salts present in 30 per cent peanut meal containing the hulls and in the hulled peanut, (b) the vitamins present, (c) the protein efficiency for maintenance of growth, (d) the value of alfalfa in supplementing the raw peanut kernel with fat soluble and inorganic material.)

4.—“The Toxicity of White Snake Root.”

(See note under Beef Cattle Office.)

5.—“Onion Flavor in Milk.”

(Drs. Halverson and Combs are continuing this project.)

SOME TABULATED SUMMARIES

A general view of the activities of each office may be had from the following table:

<i>Name of office</i>	<i>Number Meetings</i>	<i>Number People Attending</i>	<i>Letters Written During Year</i>
General office (Gray).....	5	920	1250
Dairy extension.....	150	7,496	3,000
Swine extension.....	15	2,196	1,601
Poultry clubs.....	132	13,413	1,138
Beef cattle and sheep.....	82	1,503	6,667
Swine investigational office.....	3	300	600
Dairy investigational office.....	2	220	800
Poultry investigations.....	8	359	1,275
Totals	397	26,407	16,331

PUBLICATIONS DURING THE YEAR

The Value of Soy Bean Meal as a Food for Chicks, by Kaupp, in Poultry Item

Fattening Birds for Market, by Kaupp, in Poultry Item.

Secondary Agricultural Schools as a Means of Furthering Poultry Work, by Kaupp, in Poultry Item.

Division of Profits where Landlord and Tenant Raise Poultry, by Kaupp, in Poultry Item.

Dry Lot vs. Range Methods of Handling Hens, by Kaupp, in Poultry Item.

Data on Amount of Feed Required to Produce a Dozen Eggs by Hens of Different Breeds, by Kaupp, in Poultry Item.

Better Males are Needed for the Farm Flock, by Kaupp, in Poultry Item.

Factors which Influence Winter Egg Production, by Kaupp, in Poultry Item.

Prolapse or Eversion of the Oviduct and Cloaca in a Laying Hen, by Kaupp, in American Journal of Veterinary Medicine.

Bacillary Edema and Suppuration of the Fowl, by Kaupp, in American Journal of Veterinary Medicine.

Egg and Poultry Markets Before and After the War, by Kaupp, in Progressive Farmer.

A Case of Spindle-celled Sarcocystis of the Skin and Subcutaneous Tissues, by Kaupp, in Journal of American Veterinary Medical Association.

Investigation of the Death of Chicks. Coccidian Hepatitis, by Kaupp, in Journal of American Veterinary Medical Association.

A Study of Some Feed Mixtures with Reference to their Potential Acidity and their Potential Alkalinity, by Kaupp, in the Journal of the American Association of Instructors and Investigators.

The Value of a Full Ration for the Dairy Cow, by Combs, in Extension Circular No. 107.

Building a Fence, by Shay, Kimrey, Evans, Kaupp, in press.

A Study of the Factors Involved in Producing Milk in North Carolina, by Combs, in North Carolina Department of Agriculture Bulletin, April, 1920.

Score Cards for Mules, by Hostetler, Extension Circular No. 109.

The Value of Mineral Mixtures for Hogs, by Gray and Hostetler, North Carolina Department of Agriculture Bulletin, May, 1920.

Score Card for Draft Horses, by Hostetler, Extension Circular No. 100.

Wintering Beef Cattle in Western North Carolina, by Curtis.

Beef Club Bulletin, by Curtis, in manuscript.

Sheep Club Bulletin, by Curtis, in manuscript.

Beef Butchering Rings or Circles, by Sloss, in manuscript.

Report of Progress, Cottonseed Meal Work, by Curtis and Combs, in editor's hands.

THE STATE FAIR

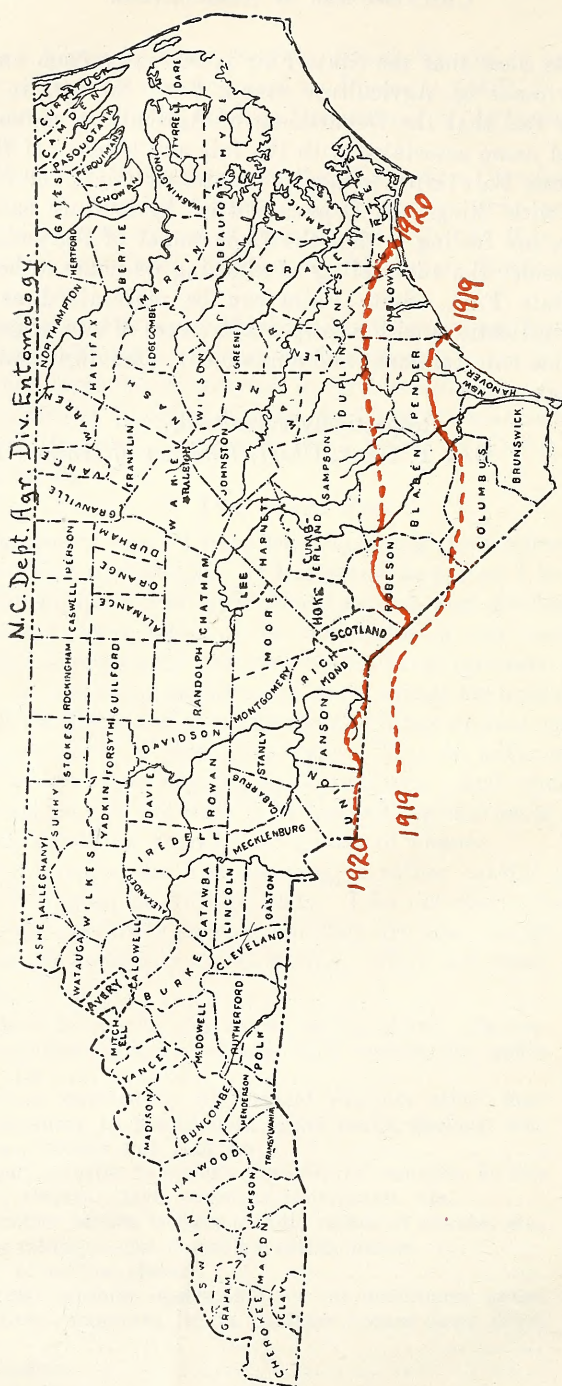
For a number of years I have been watching the tendency and spirit of the State Fair at Raleigh. It has never, as far as I know, reflected the agricultural spirit and agricultural growth and development of the State. In fact, there seems to be very little, if any, serious attempt made to have it represent our real agricultural interests and developments. It is just about as far away from things agricultural as it can get. All of its efforts and thoughts seem to hinge around commercialism and mid-ways—two of them this year. This is unfortunate. Fairs are places where whole families go for outings. And when they do go I'm convinced they do not wish to be met with questionable and indecent amusements, gambling booths, and games of chance.

This year I made, the first morning, a rather careful personal survey of everything on the fair grounds. I do not claim that the following figures are absolutely correct, but they are near enough to the truth to eliminate the necessity of quibbling. Here are some of the facts I gathered:

1.—Total space devoted to side shows, eating places, commercial exhibits, games of chance, palm readers, etc., space paid for.....	157,110 sq. ft.
2.—Total space devoted to educational exhibits other than agricultural, as health dept., good roads, geology, etc., space probably not paid for.....	5,360 sq. ft.
3.—Total space devoted to strictly agricultural exhibits, as live stock, Federal Govt., counties, individuals, etc.....	12,300 sq. ft.
4.—Total number shows, trinket stands, games of chance, etc., along midway—not including eating places.....	153
5.—Number of eating places.....	95
6.—Commercial exhibits—space paid for—as machinery, autos, fertilizer companies, lights, business houses down town, etc.,	91
7.—Palm readers.....	22
8.—Games of chance.....	71

These facts show that the State Fair is far away from anything the State Department of Agriculture stands for. So far, in fact, that many people feel that the Department of Agriculture cannot afford to have its good name associated with the fair any longer. If the authorities of the State Fair refuse to modify its present spirit, and fail to bring it into line with things the Department of Agriculture can stand for and approve, my feeling is that the Department of Agriculture should seriously consider the advisability of allowing its name to be associated with the State Fair. State Fairs can be maintained as high-class educational institutions with a proper admixture of educational features and wholesome entertainment and amusement. Our own should be lifted onto that high plane.

Respectively submitted,
DAN T. GRAY, *Chief, Division of Animal Industry.*

[illegible]

REPORT OF THE STATE ENTOMOLOGIST

To the COMMISSIONER OF AGRICULTURE.

SIR:—I submit to you, and to the board, report for the year with budget estimates for the year to come. This report covers all phases of our work.

STAFF

We have apparently now passed through the period of shifting and readjustment which was to be expected following the war emergency and the consequent soaring prices and unrest. Such changes as have occurred in our staff (noted elsewhere) have left our division fully as well provided as before, every new appointee having in every way measured up to requirements. The two new positions provided by the board a year ago were filled by appointment of Messrs. V. R. Haber and C. S. Brimley.

OFFICE AND EXECUTIVE WORK

As the division expands its activities there is an inevitable increase in the routine work of the office to keep all the details in order—reports, outlines of work, expense accounts, manuscripts of many sorts, orders for equipment, bills, etc. Also on all correspondence pertaining to insect pests has been handled as promptly as possible.

PRINCIPAL INSECT OUTBREAKS OF THE YEAR

1. *Canker Worms in Mountain Forests*.—For the fourth successive year the fall canker-worm defoliated trees over certain areas in our mountain forests in May and June. This matter was studied in some detail and is further discussed under another head.

2. *Leaf-louse and Lady Beetles on Cotton*.—In June and July the leaf-louse became abundant on cotton, and was soon attacked by its natural enemy, the convergent lady-bettle. Farmers, however, were prone to believe that the lady-beetle was a partner in the injury, and we devoted considerable effort to showing them that it was really a highly useful friend working in their interest.

3. *Fall Army-worm*.—Three successive destructive generations of this insect developed in this State this year. The whole southeastern half of the State (approximately the cotton-growing region) was principally affected—but the last generation was also destructive in the upper Piedmont.

4. *Cotton Boll-worm*.—This insect, which is the same as the ear-worm in corn, was unusually abundant, often working in connection with the anthracnose disease.

5. *Cotton Boll-weevil*.—At this writing (November 5th) the weevil is still making its usual fall migration, hence the present statement is only preliminary. Its northward spread this fall has already covered the southern portions of the counties of Union, Anson, Richmond and Scotland; main portions of Robeson and Bladen; southern one-third of Sampson, southern third of Duplin, and southern half (or more) of Onslow. As yet it has not spread as far as its yearly average would indicate, and very much less than its spread last year, 1919. There has been nothing to indicate that the withdrawal of our old quarantine has done any harm whatever, and I wish to thank the board for its vote on that point. I think it was a proper and truly progressive step.

INSPECTION WORK

Nurseries.—The regular inspection of over fifty nurseries in the State was made by Mr. T. B. Mitchell, in place of Mr. Eckert, resigned. Mr. Mitchell did his work with entire satisfaction, and certificates have been sent out covering the nursery trade of the coming year.

Boll-weevil.—The scouting to determine spread by boll-weevil during this fall is being done by our workers in coöperation with Mr. E. S. Tucker of the U. S. Bureau of Entomology. Of our men Mr. Mitchell has done most of this work, and Mr. Mabee and Mr. Haber each a part. The findings have already been mentioned.

INVESTIGATION WORK

Potato Spraying.—The spraying work with late potatoes has been continued at the Mountain Branch Station at Swannanoa, in which work Mr. Leiby and Mr. Haber have had the best coöperation from Mr. Clapp, superintendent of the farm. The results of five years of this work were reported in Bulletin 254 of this department, and show a highly profitable return from spraying by a regular schedule of applications.

Tests for the third year were conducted on early potatoes in the eastern part of the State—and we are finding the results there to be more profitable than we had anticipated.

The whole subject of spraying potatoes is presented in easily understood form in Extension Circular No. 103 by Mr. Leiby, issued March, 1920. Only a lack of labor should stand in the way of every commercial potato grower in the State following a regular spraying program with homemade poisoned Bordeaux Mixture. Although the results are less spectacular because the tubers grow underground, yet the actual profits are fully as striking as in the spraying of apples.

Larger Corn Stalk-borer.—After five years investigation of this insect by Mr. Leiby, the results have been published in Bulletin 274 of this department, (August, 1920) and I wish to commend this piece of work in the highest terms. The careful working out of the life-history of

the insect shows that the farmer who needs to combat it can avoid much of the trouble by planting May 25 or later so as to escape injury by the first generation, which practice will in itself lessen the number of the second generation. Liberal fertilization helps the corn to out-grow later injury, and rotation of the crop also lessens liability to attack. Finally a close study of the winter mortality of the insects shows that plowing out of the stubble in the fall greatly increases the death-rate among them. All of which is abundantly supported by observations, recorded data and filed tests. The problem affects mainly the eastern part of the State.

For years I have referred to this project as under investigation, and it is a pleasure now to point to the published result.

Dusting Late Cabbage to Control Worms.—Tests under this head are still under way at the Mountain Station, and results continue to show a profit from dusting the growing plants frequently and lightly with arsenate of lead and air-slaked lime in proportion of 1 pound of the poison to 8 pounds of lime.

Pecan Insects.—As indicated in previous report, this project is well advanced, and should be ready for publication in a year or so.

Insect Survey.—For nineteen years we carried this permanent and comprehensive project without special funds and without anyone especially assigned to it, most of the work during those years being done by the writer (Sherman). During that time we built up a card-catalogue of insects of the State, enumerating (December, 1919) 5,254 species. At the meeting of the board, December, 1919, provision was made whereby we engaged Mr. C. S. Brimley, who has since been engaged on this project. The list has gone forward with increased speed, 493 species being added thus far during 1920, bringing the total to 5,747 species (kinds) of insects now known to inhabit the State.

The growth of the State list is but an index—correlated with it is our constantly growing collection—and from this work we are better and better enabled to understand the scope of our field and to solve many puzzling problems without depending wholly on specialists elsewhere who are crowded with other work. Many of the additions to the list have been beneficial parasitic insects, identified by Mr. Brimley of our own staff. I wish to re-state the conviction, given from time to time during the past twenty years, that I can conceive of no project more broad and important in its whole bearing than this one—it is economic, scientific, biologic—and it is permanent. We will never exhaust it in the life-time of any of our present workers.

Fall Army-worm.—During the summer outbreak of this pest we tested the use of dust poison at rate of 1 pound of dry lead arsenate to six pounds dust lime—this being the same (except a little more concentrated) as the mixture we so successfully used against green clover-worm in 1919. It worked well. There is no doubt in our minds that the dry dust poisons simplify the general problem of controlling sudden

outbreaks of this and related insects on low-growing plants. When we first surrounded a field with a protective furrow, and then used the dust on the waste grass around edges *inside* the furrow, the protection was virtually complete. The key to success lies in detecting the outbreak early, and being so prepared as to apply the measures without delay.

Cutworms.—In the first year's study on this project, Mr. Brimley has reared to maturity a number of species and is getting data on the relative abundance of them in the different parts of the State. Thus, while the list of destructive species at Wilmington may be almost identical with a similar list from Asheville—yet the one or two species which are most prevalent in one of these places may not be the ones which are most prevalent in the other.

Household Insects.—Mr. V. R. Haber is following this project, with studies of cockroaches, clothes moths, fleas, and others of that general class. Curiously enough, since we started this project, several matters under this head have come to our attention which were of important proportions: (1) a cotton mill had hundreds of spools of yarn which were cut to pieces in storage by a small worm, and (2) a hosiery mill sent samples of manufactured hose which were being riddled by insects. Such outbreaks, in wholesale quantities of clothing materials, are too important to be ignored.

Fall Canker-worm.—An investigation by the writer (Sherman) was made in May and June in an area on Humpback Mountain, Avery County, which was attacked for the fourth consecutive year. As this area, like most of the others involved, consisted of wild forest without roads, no artificial means of control was practicable, and attention was centered upon the natural enemies which tend to subdue the worms. Omitting details, which are on record in our notes, it may be said that insectivorous birds seemed to gradually concentrate in the area, and the same seemed true of certain predaceous insects. Insect parasites of the worms appeared to be scarce, likewise fungus and bacterial diseases—but an egg-parasite prevented the hatching of a considerable percentage of the eggs. In the area studied the defoliation was not as severe as it had been in previous years, and this gives ground for the hope that the natural enemies may gradually gain control there and elsewhere, although some of the other areas suffered this year as badly as before.

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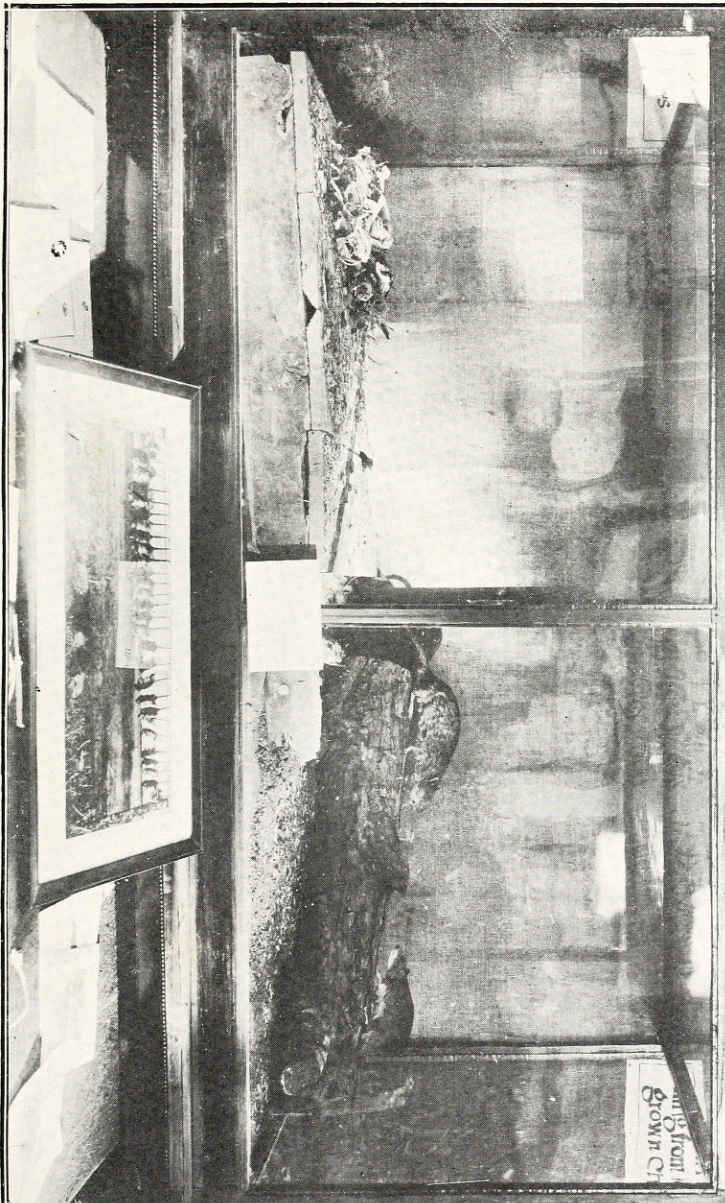
And thus the problems arise. Even when we have a full schedule of specified projects sudden and unforeseen outbreaks will create issues which must be studied at once, even if scheduled ones have to be held in abeyance for a time, for we have not yet learned to know in advance what insect problems will arise in any given year.

Not one cat in a N
hundred will tackle
old roughrucks like these

Do you want these handsome
Destructive, Disease Carrying
Animals to over-run your
place. Hussy you dont so get busy.

a good snappy Terrier
will handle them as fast
as they come.....

from
Glow n' Cr



EXTENSION WORK

Our "Extension" activities are conducted through and with the co-operation of the county farm agents so far as possible. They are informed in advance of visits of our extension workers when they go to the counties for planned public demonstration work. When meetings are desired the agents arrange them—and they frequently accompany our workers in their visits to individual farmers. They form an important link in our chain of work. They submit numerous questions and specimens to us, and our publications are largely distributed through them. Our workers attend many of the conferences of the agents, and many visits to our office are made by the agents. The agents inform us of insect outbreaks, locate fields for tests or demonstrations, or call on us to visit their counties to help their people. I gladly acknowledge the help which the agents give to this division, and I cherish the hope that the agents would testify, if need be, to the coöperation which we give them. Our relations are wholly helpful and cordial in every way so far as I have seen, heard or experienced.

Extension Beekeeping.—Mr. C. L. Sams has continued in this project with his usual interest and success. The present year has been above the average in honey production, and as this work proceeds a larger proportion of the product is offered in the standard packages and containers. At the same time that our beekeepers are coming more to meet the requirements of exacting markets, they are supplying the home market, which is perhaps the best of all, and in some respects less exacting. The beekeepers are learning the grades and classification of honeys. Many local meetings of beekeepers have been held with instructions and demonstrations in re-queening, transferring, building up in preparation for honey flow, winter preparation, etc. Many of our beekeepers are improving the stock of their bees, as well as their equipment for operations. A number of the county agents have shown special interest in this work, and there are a number of County Bee Clubs. Among the counties where much of this work has been done may be mentioned, Wake, Pitt, Beaufort, Columbus, Pender, Cabarrus, Buncombe, and Madison.

On invitation of Prof. Metcalf of the Agricultural College, Mr. Sams coöperated in arranging for and conducting a short course for beekeepers which included a demonstration in transferring before the State Farmers Convention. He likewise coöperated in securing exhibits for and managing the very creditable beekeeping display at the State Fair in October. The State Beekeepers' Association, now apparently on good permanent footing, held its fourth annual meeting at Greensboro in January and preparations are now being made for the fifth meeting to be held at Wilmington.

County agents are well informed as to this work.

Extension in General Entomology.—Mr. Smith resigned this work in early summer and the vacancy was filled by the appointment of Mr.

W. B. Mabee, who has prosecuted the work with entire satisfaction. Many visits have been made to county agents, farmers, and attendance at called meetings and demonstrations. Trees in bearing orchards have been carefully sprayed, and the effects in control of insects noted—this in coöperation with divisions of horticulture and pathology and with county agents.

During the outbreaks of cotton leaf-louse and fall army-worm, Mr. Mabee was occupied in giving correct information to farmers and county agents. He also assisted Mr. Haber in preparing the insect exhibit for the State Fair—and at this writing is working in the territory recently invaded by boll-weevil—and in disseminating information about it. He prepared a letter-folder circular on this subject which is being distributed freely.

As time goes on other lines will be emphasized, such as potato spraying, cabbage dusting, safe dates for planting wheat, control of corn stalk-borer, and other matters in which we have established profitable practices, or in which such practices are already well known in the entomological profession.

It seems unnecessary to designate all the counties which have been visited by Mr. Mabee in this work. Some of them are: Avery, Mitchell, Henderson, Buncombe, Randolph, Anson, Union, Wake, Pender, Hertford, Franklin, Onslow, Carteret, and Scotland.

ADVANCED STUDY BY MR. LEIBY

At the June meeting the board made a provisional increase in the salary of Mr. Leiby, who has served us with marked ability for five years. The provisions were such that Mr. Leiby did not feel free to accept the increase, as he was already hoping to spend a year at Cornell to get the Doctor's degree. After full consideration with us he went to Cornell, his pay at the old figure ceasing October 1st. It was understood that the matter would be laid before this meeting of the board, with recommendations.

Mr. Leiby announced his intentions to return to our service after he gets the degree, which will require his presence at Cornell at least until June, 1921. His studies there are along lines calculated to fit him for better work with us. He is at our service in answering correspondence which we may send him pertaining to his special topics. He is not, therefore, wholly separated from our work, yet at present is receiving no salary from us, and is at heavy expense. I feel that great credit is due him for his brave determination to pursue his advanced studies at a sacrifice, and the following recommendations, which are covered as best they can be in my budget estimates, are intended to keep our work well in hand, and to provide part pay for Mr. Leiby during his absence.

My estimates for the new budget call for a net increase of only \$1,250 on the old budget. I regard this as minimum. While I have not asked an increase in my salary in the budget estimates, I feel that compensation for chiefs and technically trained assistants in this department is still too low—lower than the average for the country, and lower than many purely local officers in the State receive.

ACKNOWLEDGMENTS

As in previous reports, I desire to acknowledge in full my obligations to Commissioner Graham, to the Board of Agriculture, to Dr. Kilgore, and to each and every one of those associated with me in the division. For whatever of worth has been accomplished by this Division of Entomology in 1920 full credit should be given them, and for whatever has been omitted, I am more to blame than they.

Very respectfully submitted,

FRANKLIN SHERMAN, *Chief in Entomology.*

REPORT OF THE DIVISION OF HORTICULTURE

To the COMMISSIONER OF AGRICULTURE.

SIR:—I herewith submit the report of the Division of Horticulture for the year 1920.

The work of the division consists in general administration and correspondence, work of a general horticultural nature, experimental work in pomology and vegetable culture, and extension work in pomology and vegetable culture. It is the intention of this report to give in a general way the scope of work and activity of the division during the last year rather than to discuss each project in detail.

If the commissioner or any member of the board desires a more detailed report on any particular line of work, it will be gladly furnished on request.

ADMINISTRATION AND CORRESPONDENCE

A large part of the time of the chief of the Division of Horticulture is employed with matters of administration and with horticultural correspondence. The administration work consists for the most part in planning and directing the experimental work at the branch experimental stations, and in planning and arranging for the various lines of horticultural demonstration work throughout the State. With the growth and development of the experimental and demonstration projects, these duties are increasing each year.

As the division grows in scope of work and in its usefulness to the horticultural interests of the State, the amount of correspondence increases each year. While the nature of the correspondence covers many horticultural subjects, the larger part of it consists in supplying information and advice to fruit and truck growers of the State and to people from outside the State in regard to the horticultural possibilities of the section.

The correspondence ranges from 200 to 400 letters a month aside from circular letters. The growing correspondence indicates the increasing usefulness of the division to the fruit and truck growing interests of the State.

FRUIT CROP ESTIMATE REPORTS

To facilitate the compiling of the fruit crop estimates an arrangement was made with the North Carolina Crop Reporting Service to do this work on a coöperative basis. In addition to the spring report, a second report on apple conditions during September was compiled.

The fruit crop estimates issued by this office have been in much demand by the Agricultural Press, by the secretaries of the state horti-

cultural societies and by marketing organizations throughout the country. To compile these fruit crop reports, it has necessitated an extensive correspondence with growers and a large amount of work in tabulating figures. The following fruit crop estimate report for the different sections of the State was issued in July 1920:

	<i>Apples</i>	<i>Pears</i>	<i>Peaches</i>	<i>Grapes</i>
Coastal plain.....	78.50	70.00	90.00	90.00
Piedmont section.....	51.55	49.84	45.00	77.10
Sand hill section.....	45.00	67.00	90.50	92.50
Mountain section	48.73	42.00	63.18	76.79
Whole State.....	49.32	47.10	66.56	90.10

A special apple report based on conditions of October 1st was gotten out in October and showed an indicated condition of 60 per cent.

The accuracy of the fruit crop estimate reports has proven very satisfactory when compared with the fruit produced. This year there was slightly more than 60 per cent of a crop of apples produced as compared with a 60 per cent estimate.

North Carolina had one of its largest apple crops this year in spite of unfavorable weather in the spring. There was some injury to the crop in certain sections in April and during the middle of May from frosts and cold but the most general injury was caused by unfavorable weather at blooming time. The rainy weather and cold winds that prevailed in many sections during the blooming season caused poor pollination by interfering with the activity of insects. There was generally a heavy bloom but as a result of poor pollination, the drop was heavy. The very rainy summer resulted in severe damage from the scab and bitter-rot diseases in poorly sprayed orchards.

In the Sand Hill section, which is the largest commercial peach district in the State, a splendid crop was harvested. The production this year was in the neighborhood of 250 cars.

Pecans were below normal in production because of the very heavy production of last year and the unfavorable weather in certain sections at blooming time.

STATE FAIR WORK

In past years considerable attention has been given to horticultural work at the State Fair. The division did not take part in the State Fair this year because of its duties in connection with the Western North Carolina Apple Show

THE WESTERN NORTH CAROLINA APPLE SHOW

One feature of the division's work this year was the Western North Carolina Apple Show held in Asheville October 27, 28 and 29. This fruit show was conducted under the auspices of the Asheville Board of Trade and the Division of Horticulture. The fruit growers of Western

North Carolina, the Boards of Trade of the towns of that section, the North Carolina Agricultural Extension Service through its county agents in the western part of the State, and the North Carolina Department of Agriculture coöperated in making the venture a success.

The purpose of the Western North Carolina Apple Show was to stimulate a greater production of high quality apples in the State. An increased tonnage of high quality apples is greatly desired and would be of immense advantage to the industry, in that a superior marketing system could be devised. It is believed that the apple show will prove instrumental in stimulating increased tonnage in two ways:

First, by aiding the fruit growers of Western North Carolina to produce more and better apples, and to handle and market them in such a manner that the value of the crop will be greatly increased.

Second, by impressing the general public with the fact that western North Carolina is growing apples that are not excelled by any other section for size, color, and quality; and by focusing public attention on the wonderful natural and economic advantages that Western North Carolina enjoys for the production of apples.

Apple production in Western North Carolina has not kept pace with the enormous general agricultural development that has taken place in the State during the last decade. This condition is not the result of the operation of any disadvantage of Western North Carolina as an apple producing territory, but is due mainly to the fact that the value of this vast section has not been generally realized and it has remained relatively undeveloped.

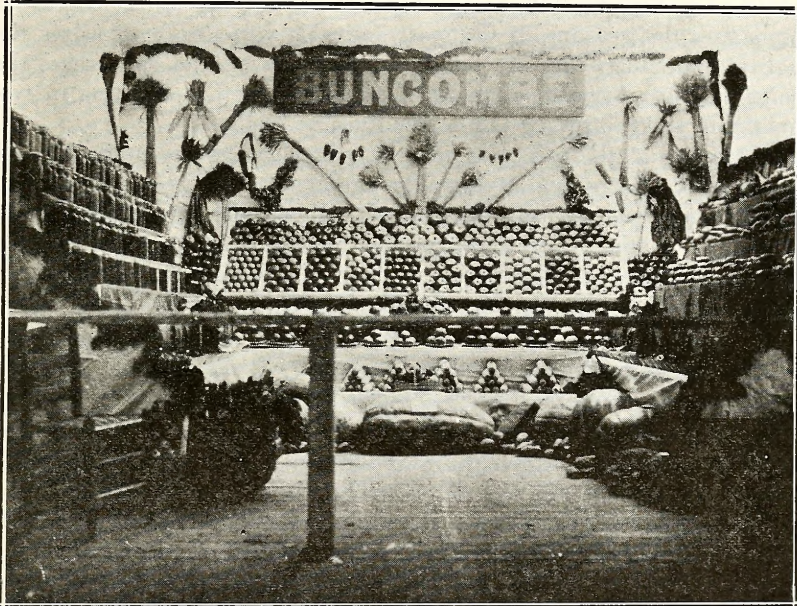
Western North Carolina possesses both natural and economic advantages as being a land of opportunity for apple growing. Among the natural advantages, those of soil, climate, topography, altitude and rainfall are important. The section possesses valuable economic points of superiority in her cheap lands and accessibility to markets.

The Western North Carolina Apple Show was primarily a fruit grower's enterprise. Every feature was worked out to make it a valuable educational exhibition for fruit growers and those interested in the development of the apple industry. No admission was charged. The show was held in two large tents. One tent housed the competitive fruit exhibits, of which there were over three car loads. The premium list of \$1,000 in cash prizes, together with the prizes donated by commercial companies, brought out a field of 89 exhibitors, which made competition very close in most classes.

The second tent was devoted to the educational exhibits of the North Carolina Agricultural Extension Service and to exhibits of commercial orchard equipment companies. Different types of power sprayers, dusters, fruit sizers, orchard implements and other equipment were displayed and demonstrated. Some very extensive county booths were in this tent.

In connection with the show, a very interesting and instructive program discussing horticultural problems was conducted. We were particularly fortunate in having speakers of national horticultural reputation on the program. While the attendance at the meetings was small, much interest was exhibited by those present.

For weeks previous to the show, an extensive publicity campaign was conducted throughout the western part of the State with the result that the show was well attended. It was estimated that over 25,000 people viewed the exhibits during the week. There was general surprise that Western North Carolina could produce such handsome fruit. It was



CHAMPION BUNCOMBE COUNTY EXHIBIT STATE FAIR 1920

the consensus of opinion of the visiting horticultural authorities from other states that they had never seen fruit in any other section equalling in size, color and flavor the apples on exhibition.

The Western North Carolina Apple Show can be considered to have been very successful for it led to the formation of the North Carolina Horticultural Society, an organization that has long been needed and one that will play an important part in the development of the fruit industries of the State. Mr. H. P. Corwith, Saluda, and Mr. John Ewbanks, Hendersonville, were elected president and secretary respectively.

A second important result of the show consisted in the development of the realization of the opportunity for an apple industry and its

value to the western part of the State by business men, bankers, and other agencies in the section to such an extent that their active assistance can be enlisted in developing the industry.

The Pathe Company took moving pictures of the show for their Pathe Weekly, a film that is shown weekly throughout the country.

JUDGING HORTICULTURAL PRODUCTS AT FAIRS

It is a policy of the division to furnish a member to judge the horticultural products at the fairs in the fruit growing sections of the State.

The horticultural premium list with score cards for use of judges, published in Bulletin 243, has proven to be of extreme value, because it emphasizes the growing of the most desirable varieties, emphasizes the quality of products that are most profitably grown, and encourages the use of the most desirable pack and packages, as well as assisting in systematizing and improving the horticultural exhibits.

In judging at the fairs, we are able to encourage the production of good marketable fruits and vegetables rather than overgrown, ungraded, diseased and insect injured material. Incidentally, the highest types of cultural methods are encouraged. In this way the horticultural exhibits at fairs and the judging work is of great educational value in improving and increasing the horticultural products of the State.

THE CO-OPERATIVE ROTUNDIFOLIA EXPERIMENT Vineyard, Truck Station, Willard, N. C.

The Rotundifolia vineyard established in coöperation with the United States Department of Agriculture at the Truck Station has furnished, through the work of Mr. Charles Dearing, Horticulturist of the United States Department of Agriculture, much valuable information regarding the training and management of Rotundifolia grapes, and in the making of grape products. Mr. Dearing has made much progress in the determination of the most desirable varieties, in the breeding of improved strains of existing varieties, and in the production of new varieties of economic importance.

During the last two years Mr. Dearing has done extensive work in determining the methods to employ in making different Muscadine products and in bringing these methods to the attention of the public.

EXPERIMENTAL WORK IN POMOLOGY

1. VARIETY WORK IN POMOLOGY. (C. D. Matthews and J. M. Dyer.)

Notes and observations on the behavior of varieties of fruits in the different sections of the State are made from year to year. These notes and observations show the range of adaptability of the varieties in different sections.

Much time and care is expended each year in writing, revising and checking descriptions of almost all of the important varieties of fruit grown in the State. These descriptions are to be used in future publications, and are employed by the division as an aid in identifying varieties of fruit sent to the office over the State.

2. NATIVE FRUITS OF NORTH CAROLINA. (C. D. Matthews).

The place of origin, the history, and the description of a number of varieties of North Carolina origin have been secured. When opportunity offered, the descriptions of varieties secured previous to this season were verified. Paintings and photographs have been made of the most important varieties.

3. INVESTIGATIONAL WORK WITH PEACHES. (Mountain Station, Truck Station, Piedmont Station, Coastal Plain Station). (C. D. Matthews and J. M. Dyer.)

(a) "*Dehorning*" *Peach Trees*.—During the last season additional progress with the peach "dehorning" project has been made. From the results so far secured it has been shown that in years when the buds are killed by cold "dehorning" is a profitable practice in renewing old trees. It has been found that the operation may be done relatively late in the spring with satisfactory results.

(b) *Peach Breeding*.—It is the object of this project to produce improved commercial varieties that are more suited to North Carolina conditions than are the present varieties. It is the purpose, also, to produce varieties hardier in bud than the present commercial sorts.

To provide working material for this project, a variety orchard containing over 60 different varieties of peaches was planted at the Truck Station during 1917. These trees have made a very satisfactory growth since being planted. During the last year nearly all the varieties had a partial crop and some very valuable preliminary work was done in regard to collecting data concerning the characteristics of the different varieties. There is a good set of fruit buds on the trees and active work is to be done on this project during the following year.

(c) *Hardiness of Peach Varieties in Western North Carolina*.—Twenty varieties of peaches, comprising varieties adapted both to extreme northern and to southern conditions, were planted at the Mountain Station in the spring of 1919 to furnish material for work on determining the relative hardiness of different peach varieties in Western North Carolina. These trees have made a very satisfactory growth since being planted.

(d) *Phenological Studies with Peaches*.—The practice of collecting phenological notes on the peach varieties in the varietal peach orchard at the Truck Station was started during the spring of 1920. These notes will be of immense value in handling the breeding project.

(e) *Variety Testing with Peaches*.—Full notes were taken on the behavior of over 50 varieties of peaches at the Truck Station. Descriptions of these varieties were secured.

4. INVESTIGATIONAL WORK WITH PECANS. (Truck Station, Coastal Plain Station and Piedmont Station). (C. D. Matthews and J. M. Dyer.)

(a) *Variety Testing*.—Twenty-two of the most important southern varieties are included in this test which has been conducted for 14 years. Gratifying results are being secured from this work, as certain varieties are showing marked adaptability to North Carolina conditions while others are proving to be undesirable. At this time valuable recommendations regarding pecan varieties for planting in this State can be made. According to the results secured, the Schley, Stuart and Alley varieties are the most desirable for Eastern North Carolina.

(b) *Individual Tree Performance Records*.—The securing of performance records of the individual pecan trees in the experimental orchards at the several stations is being continued from year to year. Such a record affords a more detailed study of the behavior of the different varieties. As a result of the individual tree performance records, it has been noted that trees of the same variety under identical conditions are uniformly heavy yielders, while others are very poor producers, that some produce uniformly large nuts and others uniformly small nuts. As these individual performance records suggest the possibility of improving and standardizing individual yields by bud selection, work has been started along this line.

(c) *Cultural Practices*.—The value of correct cultural practices, such as tillage and the use of cover crops, is clearly shown in the increased size of trees and in the increased size and number of nuts produced when compared to trees and their products grown in sod. To determine the most desirable system of tillage and cover cropping to be employed in pecan orchards, work of this nature is being conducted at the branch stations.

(d) *Pecan Breeding*.—The seedlings, as a result of pecan breeding work, that were set in 1915 at the Truck Station, are making a satisfactory growth. Some of these seedlings are of bearing size and should produce some nuts during the coming year.

(e) *Top-working Pecan Trees*.—The investigations dealing with the methods of budding and grafting employed in top-working pecan trees were continued this year. It has been found that a combination of both grafting and budding should be used to secure the most satisfactory results. As a result of years of investigation, it is the opinion of this division that top-working should be confined, as a general rule, to trees not over 8 to 10 years old to be entirely successful.

(f) *Cracking Tests with Pecan Varieties*.—The cracking test of the different varieties is made each year. The cracking test is a necessary adjunct to the performance record of a given variety in determining its value in a certain section. Very often a variety is highly satisfactory from a productive standpoint but the cracking test shows it to be nearly worthless from an utility viewpoint. The test shows the number of

nuts per pound and determines the per cent of unbroken halves the variety will crack out, the per cent of shrunken kernels, the per cent of physiological spot, the per cent of faulty nuts, the shape and size of the kernels, the texture, quality and flavor of meat, the per cent of meat and the thickness of shell. As a result of these cracking tests conducted each year, certain varieties that were satisfactory from a productive standpoint proved to be totally unsuited to North Carolina conditions.

5. INVESTIGATIONAL WORK WITH STRAWBERRIES. (Truck Station.)
(C. D. Matthews and L. H. Nelson.)

(a) *Variety Testing*.—The variety testing project with strawberries was initiated with the purpose of determining whether or not there were any other varieties more desirable as commercial market varieties than Klondike and Missionary, the two leading varieties. For this State the most profitable berry combines the characteristics of productiveness, earliness, and shipping quality. None of the varieties so far tested have shown themselves superior to Klondike and Missionary as commercial varieties. Several of the varieties have shown themselves valuable for home use.

(b) *Cultural Practices*.—During the year experiments to determine the most desirable planting dates were conducted as well as work to determine the value of removing blossoms and cutting runners. This project has not been in operation a sufficient length of time to furnish any conclusive information.

6. INVESTIGATIONS WITH APPLES. (C. D. Matthews and J. M. Dyer.)
(Mountain Station).

(a) *Pruning*.—The pruning project was begun during the year with the intention of securing information on the desirable height to head apple trees, to determine the comparative value of the open head and the modified leader system of training, and to secure information on the amount of annual pruning most desirable. To supply material for this work, an orchard containing approximately 128 trees was planted at the Mountain Station in the spring of 1919. The trees have made a very satisfactory growth and the first year's work has been completed as planned.

(b) *Apple Thinning*.—(Mountain Station and Piedmont Station.) Experiments to determine the effect of thinning fruits and leaves from the fruit spurs of the apple were initiated. Work on this project has not been conducted a sufficient length of time to supply information on the subject.

(c) *Summer Apples*.—(Truck Station.) The variety orchard of summer apples at the Truck Station bore its first crop of any size this year. Notes and descriptions were taken on each variety.

EXPERIMENTAL WORK IN VEGETABLE CULTURE

1. INVESTIGATIONAL WORK WITH SWEET POTATOES. (Truck Station).
(C. D. Matthews and L. H. Nelson.)

(a) *Variety Testing*.—It is the purpose of this work to determine the most desirable varieties of sweet potatoes for Eastern North Carolina from the standpoint of productivity, market value, keeping quality and quantity. There were 19 varieties under observation this year. The results were, in the main, confirmatory of the work of previous seasons. Certain varieties have proven their desirability while others have shown themselves to be undesirable.

(b) *Storage*.—In connection with the variety work, storage tests are being made from year to year in the storage house to determine the behavior of the different varieties in storage. Certain varieties have proven themselves to be better keepers than others.

To facilitate the storage investigational work an additional curing room was constructed during the summer.

Investigations to determine the relation of time of digging to keeping quality, the relation of proper harvesting to keeping quality, the proper method of curing, and the correct management of the house, have been continued this season.

As a result of this work the division can authoritatively make recommendations regarding varieties for storage and the most desirable methods to employ in the management of the storage house.

(c) *Cultural Practices*.—During the year work was conducted to secure information on the following different cultural practices:

- (1) The comparative value of slips vs. vine cuttings as regards productivity.
- (2) The effect of ridging on productivity and type of potatoes.
- (3) The effect of vine cutting on yield.

(d) *Seed Selection*.—The following lines of work dealing with the seed selection of sweet potatoes were conducted during the year:

- (1) To determine the relative value of seed stock from high yielding and low yielding hills as regards productivity and uniformity of potatoes.
- (2) To determine the relative value of vine cuttings as compared with slips for maintaining yield and type, commencing from the same hill.
- (3) To determine the comparative value of large and small potatoes for seed.
- (4) To determine the comparative value of seed from late vine cuttings and seed from main crop draws as regards productivity, type, and keeping quality.

Very satisfactory progress should be reported on this project for this year.

2. INVESTIGATIONAL WORK WITH IRISH POTATOES. (Mountain Station and Truck Station.) (C. D. Matthews, L. H. Nelson and S. C. Clapp.)

(a) *Variety Testing*.—(Mountain Station). The testing of varieties of Irish potatoes to determine the most desirable varieties for Western North Carolina conditions was continued this year with 20 varieties. The testing has been in progress for a sufficient length of time to afford this division the necessary information to make reliable recommendations regarding the choice of varieties for the western part of the State.

(b) *Variety Testing*. (Truck Station).—Satisfactory progress should be reported on the work to determine the most desirable early varieties for Eastern North Carolina and the best varieties for the second crop.

(c) *Hill and Tuber Unit Selection Work*. (Mountain Station).—The hill and tuber unit selection method of variety improvement is being employed in an attempt to produce strains of the best varieties with greater productivity and more desirable characters.

(d) *Cultural Practices*.—(Truck Station.) Work was conducted to determine the effects of different cultural practices on the yield of potatoes. Practices receiving consideration were:

- (1) Width of rows.
- (2) Distance apart in the rows.
- (3) Freshly cut or stored cut seed.
- (4) Effect of sprouting on yield.
- (5) Cut versus uncut seed.

(e) *Testing the Value of Different Sources of Seed*.—Experiments were conducted to determine the comparative value of Maine grown seed, second crop produced in the Coastal Plain, and western North Carolina seed in different stages of maturity as the most desirable seed for the early crop of Irish potatoes in eastern North Carolina. This work has not been in existence a sufficient length of time to furnish conclusive results.

3. INVESTIGATIONAL WORK WITH CABBAGE. (Mountain Station.) (C. D. Matthews, L. H. Nelson and S. C. Clapp.)

(a) *Variety Testing*.—The testing of varieties of cabbage to determine the most desirable varieties for western North Carolina was continued this year. The testing has been in progress for a sufficient length of time to afford this division the necessary information to make reliable recommendations regarding the choice of varieties for the western part of the State.

4. OBSERVATION GARDEN. (Truck Station.) (C. D. Matthews and L. H. Nelson.)

The all-year observation garden at the Truck Station has proven very valuable in supplying information regarding varieties and planting dates of different vegetables for eastern North Carolina. It has been of value also as a demonstration in gardening and has been an inspiration to many visitors who have seen it.

EXTENSION WORK IN POMOLOGY
C. D. MATTHEWS AND PAUL T. SCHOOLEY

Extension work in horticulture has continued to increase in value and usefulness to the horticultural interests of the State. Each year there is an increased number of calls for demonstrations. The demand for horticultural assistance has developed to such an extent that it has necessitated re-organizing horticultural extension work on a definite project basis so that the activities of the extension workers can be directed where they are most needed. The work is planned to reach groups rather than individuals. This plan has brought about closer working arrangements between the county agents and extension workers. The division has relied on the county agents to work up county and community groups for the different projects.

Very effective results were secured this year. A total of 112 meetings in 38 counties were held with a total attendance of 5,780. Demonstration work in horticulture is an important factor in the development of horticultural industries in the State as it informs the growers of the most approved methods in use. It encourages the adoption of the most up-to-date practices in fruit and vegetable production.

Active work was done on the following projects during the year.

1. ORCHARD DEMONSTRATION WORK.—For the most part, the work done under this project consists in general demonstrations in pruning and spraying given in coöperation with the county agents. The demonstrations are conducted in young orchards, in mature orchards, and in old orchards where renovation is needed. Considerable attention has been given to this type of work because of its importance, the limiting factors of apple and peach production in the State being the ones of pruning and spraying. Twenty-seven (27) meetings of this type were held during the year with a total attendance of 565.

2. ORCHARD PLOT DEMONSTRATION IN PRUNING AND SPRAYING.—To conduct this project commercial orchards were selected in five nearly contiguous apple producing counties in which to locate plats to demonstrate pruning and spraying practices. The extension specialist and the county agent coöperated in the selection of the orchards. In choosing the orchards due consideration was given to location, accessibility, and an attempt was made to secure orchards typical of others in the section in regard to variety, age, and other factors.

At each demonstration orchard there are three different plots, one both pruned and sprayed; the second sprayed but not pruned; the third a check plot neither pruned nor sprayed.

From 5 to 8 demonstrations are given at each series of plots during the year, ending with a demonstration in the fall to show the results of the treatments. Due to the fact that several of the orchards were too young for a crop this year, the number of meetings were held to a minimum. Fourteen (14) meetings were held with a total attendance of 412.

3. DEMONSTRATION HOME ORCHARDS.—It has been the plan of this work to plant one or more one-acre demonstration home orchards in each county to encourage the planting of home orchards on the farm.

The demonstration orchards have been located in coöperation with county agents and under their supervision. The plantings have been composed of varieties found by the Division of Horticulture to be most desirable for the different sections of the State.

During the last three years nearly 150 of these orchards have been planted. A majority of the orchards have developed very satisfactorily, while a few have been decidedly unsatisfactory. The degree of success of the orchards has been in proportion to the amount of attention given them in almost every case.

These orchards are to be used by the extension workers of the Division of Horticulture for demonstration purposes, so far as it may be possible.

Sweet Potato Storage.—The sweet potato storage house construction campaign was continued during the year in a very active manner.

In coöperation with the county agents, boards of trade, and other organizations, meetings were held to stimulate interest in storage house construction as well as to supply information regarding all phases of the subject. Demonstrations in harvesting and handling, construction of the house and its operation were given. The feature of the sweet potato work this year was the special sweet potato exhibit car operated by the division in coöperation with the Seaboard Air Line Railroad, the Atlantic Coast Line, the Norfolk Southern, and the Southern Railway. The railroads furnished the express car in which the exhibit was housed and transported it from place to place. The main feature of the exhibit car was a model sweet potato storage house built on the exact scale of the government plan and which for purposes of demonstration could be taken to pieces and reconstructed, section by section, to illustrate the important points in the construction of a storage house.

Other material in the exhibit furnished information regarding storage and storage house construction, disease and disease control, sweet potato grades and marketing.

The exhibit was in charge of the Extension Horticulturist who had associated with him representatives of the Division of Plant, Pathology and Markets, the railroads, district demonstration agents and county agents. The car was attached to regular trains and was dropped at the various stations for a period of several hours, where the exhibit was open to the public and the advice of the experts in charge was available. The trip of the exhibit car extended over a period of three weeks and was very successful. The car travelled 1,100 miles, visited 22 counties, stopped at 30 towns with a total attendance of 2,825.

Respectfully submitted,

C. D. MATTHEWS, *Acting State Horticulturist.*

REPORT OF DIVISION OF AGRONOMY

To the COMMISSIONER OF AGRICULTURE.

SIR:

In this report is covered the year's activities of the Division of Agronomy ending with November 30, 1920, and some observations on the results of experimental and extension work with soils and crops, conducted jointly by the State College of Agriculture and Engineering, and the State Department of Agriculture. A small amount of the work has been conducted in coöperation with the United States Department of Agriculture under approved plans and agreements.

During the year the division has been somewhat handicapped by the loss of some of its best workers who have been taken by commercial concerns at advanced salaries. However, taking the work as a whole, it has progressed quite satisfactorily, particularly is this so with the experimental work. Both the experimental and extension work have been conducted during the year along the general lines mentioned in previous reports. It is believed that the work is organized on a fundamental and safe basis and that, therefore, it is not necessary to make any material changes from year to year in the general plan of operation. It will become more important, however, as time goes on to adjust the extension activities, which can be done much more easily, to meet the demands and needs of the farmers of the State.

SOIL SURVEY

The soil survey work of the State, which is being conducted by the division in coöperation with the Federal Bureau of Soils, has been pushed as rapidly as is consistent with the best interests of the work. The survey is fundamental to almost all of our other work, as it lays the foundation for the conducting of agronomic work in the most intelligent and logical manner. During the year surveys of Tyrrell, Durham, Buncombe, and Guilford have been completed, and considerable work done in Onslow. It is expected to finish Onslow during the winter and at the same time carry on work in another of the eastern counties.

Since the greatest problem before the farmers of North Carolina is the maintaining and building up of their soils in a productive state, a large amount of effort of the Division of Agronomy has been given over to the study of the fertilizer needs of our soils for the production of the best paying crops yields. For it is realized that if our farmers are to get the most out of their farming operations and are to transmit to their children productive farms, it is of the highest importance that they not

only secure good yields of the different crops for themselves, but they shall, too, put into operation proper methods of maintaining and building up the producing power of their soils.

It is felt that in order for the general farmer to increase the productiveness of his soil it will not only be necessary for him to use commercial fertilizers and lime judiciously, but also that he shall put into practice a system or systems of crop rotations in which suitable legumes find their place at frequent intervals. It should, too, be kept in mind that not only will it be necessary for him to grow these nitrogen gathering crops in rotation with his main money crops, but that he shall after they have been grown so handle them as to add in a practical way to the organic and nitrogen supply of his soil and at the same time have the exhaustion of the phosphoric acid and potash reserves of his soil to be as small as practicable. In order to do this, generally speaking, for the average general farmer, it becomes necessary that a considerable acreage shall be grown every year primarily for soil improving purposes. It is not possible, ordinarily, in growing leguminous crops to remove them from the land after they have been grown and have the growth of them benefit materially, if at all, the producing power of the soil. One of the greatest errors in the minds of many of our people has been that they in many cases have assumed that it is possible by the growth of a leguminous crop on the land to build up its productiveness by simply growing the crop on it and removing the crop after its growth. This cannot be expected to materially improve the soil, certainly not in a permanent way, as more plant-food is removed from the soil than is added. It is very rarely the case where such crops when removed would even add to the soil a larger amount of nitrogen than was originally in the soil. County agents and others who are interested in promoting better systems of agriculture among our people may devote to good advantage a considerable portion of their time to giving definite and reliable information to our farmers with reference to the proper principles of building up the producing power of their soils, and at the same time secure from them an economical production of crops. Millions of dollars are being spent annually by the farmers of North Carolina for the use of commercial plant food. This expenditure cannot be made in the wisest way unless proper systems of crop rotation on the farms of the State are being practiced and the crops after growth are handled in the wisest way. In other words, commercial fertilizers cannot be expected, nor do they give, generally speaking, the best financial returns when used on poor soils that are handled by poor methods of crop rotation and cultivation.

The soil fertility investigations are being conducted at present by the Division of Agronomy mainly on the following experimental farms and fields:

Buncombe, Swannanoa; Iredell, Statesville; Central, Raleigh; Edgecombe, Rocky Mount; Washington, Wenona; Pender, Willard; Granville, Oxford.

To study the deficiencies of the different types of soil throughout the State, tests are being conducted on the distinct types of soil located at the points indicated below:

FOR MOUNTAIN SECTION

Toxaway Silty Loam, Andrews; Porter's Loam, Swannanoa; Toxaway Loam, Swannanoa.

FOR PIEDMONT SECTION

Davidson Clay, Linwood; Cecil Clay Loam, Statesville; Mecklenburg Clay Loam, Concord; Durham Sandy Loam, Oxford; Granville Sandy Loam, Franklinton; Wilkes Sandy Loam, McLeansville.

FOR COASTAL PLAIN SECTION

Norfolk Fine Sandy Loam, Rocky Mount; Portsmouth Fine Sandy Loam, Pantego; Muck, Moyock; Norfolk Fine Sandy Loam, Willard.

In connection with the farm life schools of the State, experiments are being conducted, too, along the same general lines as the soil type studies, with one exception that one plot receives stable manure. At present experiments are being conducted at the following schools:

IN PIEDMONT SECTION

Lowe's Grove Farm School, Durham; Parrish Agricultural High School, Bahama.

IN COASTAL PLAIN SECTION

Aulander Farm Life School, Aulander; Red Oak Farm Life School, Rocky Mount; Sand Hill Farm Life School, Carthage; Craven County Farm Life School, Vanceboro.

MISCELLANEOUS SOIL TESTS

Miscellaneous tests were begun at the following places to study different soil fertility problems:

At Edgcombe Farm.—To study the effect on the quantity and grade of peanuts of applications of limestone, gypsum and sulphur. To decrease the number of factors no plant food was added to the different plats. This experiment has not yet progressed far enough to justify a statement of results and conclusions.

At Lowe's Grove, Central Farm, and Manchester.—Experiments were started this year to compare the relative efficiency of nitrate of soda and sulphate of ammonia as carriers of nitrogen used on cotton as top dressers at different dates. These experiments will have to be continued for a time before deduction may be safely made from the results.

At Wadesboro, Iredell Farm, Pender Farm, and Buncombe Farm.—Experiments have been started to compare the relative value of raw rock phosphate, soft rock phosphate, basic slag, and acid phosphate as carriers of phosphoric acid, using large amounts of nitrogen and potash to reduce the number of limiting factors. So far acid phosphate has generally given greater and better paying yields than have the other carriers of phosphoric acid.

Work has been started on peat soil at Wenona to determine the effect on the growth of crops by turning the soil at different depths.

Tests with cotton and corn to study the efficiency of phospho-germ against a complete fertilizer have been conducted during the year at Wadesboro, and at the Central and Iredell farms. Available results so far do not indicate that phospho-germ has measured up in value to the commercial fertilizers used comparatively.

FERTILIZER EXPERIMENTS AND RESULTS AT THE DIFFERENT FARMS

At Washington Farm.—In an experiment on Field A it was planned to study the effect of different combinations of fertilizers on peat soil, with and without lime, when used singly, in combinations of two, and all three elements of plant food. One plot also received basic slag. Although there have been some crop failures in this experiment, sufficient data has been secured, it is felt, to justify a statement that lime is decidedly the first most important constituent needed by this soil, after drainage, for good crop results. The addition of phosphoric acid and potash has shown no benefit when used alone or in combinations and sometimes a depressing effect. Of the crops tried, corn has been the only successful crop grown thus far.

Increasing the amount of lime, within the limits used, has given increases of crop yields. To be enabled to answer the questions of how much and what forms of lime to use on this kind of soil to best advantage an experiment was begun in the spring of 1917. Three forms of lime are being tested—hydrated lime, ground limestone and marl. The quantities used are the equivalents of one ton, two tons, three tons, and four tons of calcium carbonate per acre applied once every three years. Results of three years' field experiments have been secured and indicate that more than one ton of lime is needed per acre; also that marl is not quite as efficient carrier of calcium as are other forms of lime.

At Pender Farm.—In 1915 an experiment was begun on Fields A and E at this farm to determine the best combinations of fertilizers to use on this type of soil, using corn, oats and vetch, and cotton in a three-year rotation with a cover crop always on the land. Several failures have been marked up against this field on account of the corn-bill bug. So far, nitrogen has shown to be the constituent most needed for better crop yields. When two and three times normal amounts of nitrogen are used increases in crop yields are secured. Phosphoric acid with nitrogen has given more increases than potash with nitrogen. Lime has shown up well, especially with soy beans, and is paying for itself. The field at this farm is in poor physical condition, but it seems from now on more striking results should be secured. The use of basic slag has not shown up quite as well as acid phosphate.

In 1918 another experiment was begun to test the relative efficiency of different carriers of phosphate. The field is divided into eight plots with limed and unlimed ends. The first crop—corn—was a partial failure, but acid phosphate gave greater yields.

At Edgcombe Farm.—The main fertilizer tests at this farm are on Fields A, B, and C, using a three-year rotation consisting of corn cotton, and peanuts, with a cover crop every year. In these tests on this type of soil nitrogen and potash have shown to be the first important constituents of plant food to be supplied for best crops. On Field A the application of nitrogen and potash has paid better on an average than has the use of a complete fertilizer. With larger amounts of nitrogen and potash, phosphoric acid begins to show up. The results show as a whole that farmers of the Coastal Plain section are not using enough fertilizer for cotton and that the formulas used are not the best for the most economical production. More nitrogen and potash should be used with the phosphoric acid remaining about the same or slightly reduced.

In the rotation tests on this farm, the results show that corn every year and cotton every year is better than a simple rotation of corn and cotton without cover crops, when fertilizer is used. When legumes are introduced in the rotation better yields of all crops are secured. The manure plot has shown us that organic matter is a big factor on this type of soil.

The use of rock phosphate has not given as good results in the main fertilizer tests as has acid phosphate.

In the study of different carriers of nitrogen, nitrate of soda still leads with sulphate of ammonia coming second in value as a carrier of nitrogen. All the carriers of organic nitrogen tried did not show the efficiency in promoting yields that the inorganic forms did.

In the test in sowing lespedeza in the spring, the results show that even with the addition of limestone and phosphate our climatic conditions are such that it cannot be safely depended upon as a hay crop. A test to determine the effect of winter-killing on crimson clover, using seed from foreign and native sources, did not show any decided difference last year. It was repeated this year with the same general results.

At Iredell Farm.—With the type of soils at this farm the evidence is still conclusive that phosphoric acid and nitrogen are the controlling factors for better crop yields. Lime is giving good results and the yields of crops indicate where more organic materials are incorporated into the soil, which can be secured by the use of legumes and lime, the capacity of the soil to make larger crop yields is increased by the increased efficiency of fertilizers added.

In rotation tests the results show that corn every year and wheat every year with fertilizers is just as good as a two-year rotation of

corn and wheat with fertilizers and that when legumes are added in the rotation, such as red clover, cowpeas, or soy beans, better crops are secured.

In the study of different forms of nitrogen carriers nitrate of soda and sulphate of ammonia have given greater efficiency than any other common carriers of this constituent since the beginning of the experiment. No noticeable residual effect is manifested on plots receiving organic carriers of nitrogen over the inorganic carriers.

In the regular fertilizer experiments finely ground rock phosphate has not generally shown as efficient as a provider of phosphoric acid as acid phosphate. In the test where rock phosphate is used in amounts varying from 500 pounds to 4,000 pounds complete fertilizers using acid phosphate as the source of phosphoric acid has shown up better in all cases with corn and wheat, except where 4,000 pounds of rock phosphate was used to the acre. This latter plot seemed naturally a little more fertile from the beginning and has kept up. Beginning in the fall of 1919, plot No. 1, which received a complete fertilizer, the application was changed to acid phosphate alone. By this change a fairer comparison will be obtained against the different amounts of rock phosphate.

No conclusions can yet be drawn in regard to the efficiency of nitrogen as a carrier of nitrogen.

In the spring of 1919 a test was started to show the efficiency of soft phosphate rock as against acid phosphate. Up to this time acid phosphate has given greater yields with both cotton and corn.

At Buncombe Farm.—In the regular fertilizer experiment phosphoric acid, nitrogen, and lime seem to be the controlling factors for better crop yields with both bottom and upland soils.

In the rock phosphate test, in which comparison is made of the value of ground phosphate rock and acid phosphate, alone, with stable manure, and with legumes, the acid phosphate has given greater crop yields and net returns under all conditions and with all crops.

Lime is beginning to show up on the soils of this farm, and with red clover in the rotation should be considered one of the first materials required to be applied for best paying results.

At Central Test Farm.—The experiments here have brought out the importance of having more vegetable matter incorporated in the soil so that the crops will be better enabled to take advantage of the applications of plant food applied. Nitrogen and phosphoric acid give increased yields, with potash of little importance for increased production until nitrogen has been applied in goodly amounts. It has been shown that a rotation of corn and cotton without lime and using rye and crimson clover as a winter cover crop will not frequently do for this type of soil in this part of the State where dry spells are apt to occur to decrease or stop the crop growth. Basic slag, nitrogen and potash

under cotton every year with crimson clover has seemed to have kept up the yields better than other rotations.

A test was started this year to determine the efficiency of nitrate of soda and sulphate of ammonia on cotton, each applied at four different dates. On account of variable season this test will have to be run several years in order to secure most dependable results.

An experiment was started this year to determine the value of phospho-germ as a fertilizer. Trona potash under corn is being tested, using different amounts of potash and supplying a liberal amount of both nitrogen and phosphoric acid.

An experiment has been started to see if lime and acid phosphate will be able to produce profitable crops when used with legumes or corn-crop residues turned under every year. Also two forms of lime are used and in different amounts. On Fields A and B at this farm manure at the rate of seven tons per acre was broadcast this spring and soy beans fertilized and sown to be turned under, and then rye was sown. This was done to bring back these plots to a higher state of fertility as recent yields indicated that on account of the poor physical condition the crops were not getting the benefit of the fertilizers applied.

A spring sowing of lespedeza was started in 1917 in coöperation with the U. S. Department of Agriculture at this and at the Edgecombe farm, using lime and acid phosphate, to see if a successful hay crop could be made. So far negative results only have been recorded. The main reason for the poor results has been due to the growth of grass and weeds before the clover gets started. The seasons in this section seem to be too hot and dry for a satisfactory growth of this crop for hay on soils similar to those of this farm.

SOME GENERAL CONCLUSIONS FROM FERTILITY EXPERIMENTS

At Buncombe Farm.—(1) With the main fertilizer experiments the value of phosphoric acid, nitrogen and lime is still maintained and are the controlling constituents for better crop yields on both the upland and bottom soils of the mountain section.

(2) The rock phosphate test still shows phosphoric acid carried by acid phosphate as better for larger crops than is finely ground raw rock phosphate.

(3) In the rotation experiment, where lime is used with red clover, fine returns have been secured. The legume plots show up much better than where no cover crop was used.

(4) The soft phosphate experiment has given indications that acid phosphate is better for larger crops than other carriers of phosphoric acid tried.

At Washington Farm.—(1) The use of all fertilizer mixtures tried has failed to pay.

(2) Applications of lime usually assure good crop yields and the use of two tons is better than one ton.

(3) Three tons of calcium carbonate per acre does not increase the yield but very little more than two tons.

(4) Marl has been found to be a poorer carrier of lime than is limestone or burnt lime.

(5) Three tons of marl are better than two tons.

(6) Burnt lime is no better than the use of raw ground limestone.

At Pender Farm.—(1) Nitrogen stands out as first in importance to be provided on this soil. Phosphoric acid comes next when used with nitrogen. The use of potash has not shown up to very good advantage.

(2) Lime is quite beneficial on soy beans and probably other legumes.

At Edgecombe Farm.—(1) More fertilizer of the right kind is needed for cotton than is commonly used. The ordinary formulas as used by farmers should have more nitrogen and potash. The use of lime shows up to advantage.

(2) A corn and cotton rotation simply is no better than corn and cotton each year on the same land. When legumes are introduced they show up to good advantage.

(3) Nitrate of soda and sulphate of ammonia are two of the best carriers of nitrogen for corn and cotton. They will have to be used with proper safeguards.

At Iredell Farm.—(1) Phosphoric acid and nitrogen are still the most important factors for better crops.

(2) In rotation studies, corn and wheat every year is as good as corn and wheat in rotation. Legumes show up in this rotation to good effect.

(3) Very large applications (4,000 lbs. per acre in each rotation as clover is being turned in) of finely ground rock phosphate have shown up a little better than a complete fertilizer with red clover in the rotation.

(4) Nitrate of soda and sulphate of ammonia, properly used, are two of the most efficient carriers of nitrogen tried for the growth of corn and cotton.

At Central Farm.—(1) Organic matter from some source, and if grown, lime to assist, stand out as very essential for larger and better paying crop yields.

(2) Spring is not the time to sow lespedeza for hay in this section.

(3) The use of basic slag and crimson clover are suitable to keep up the yields of cotton.

(4) Phospho-germ has given poor results in the growth of rye.

TOBACCO EXPERIMENTS AT REIDSVILLE

The general fertilizer experiments have been continued. The most important observation this year was the striking evidence of the effect of seasonal conditions on the action of fertilizers—the resulting growth being much larger than in former years, the quality remaining very good on even the heavier fertilized plots.

The special potash experiments gave results the most striking ever obtained at this farm. "Wild-fire" affected this set of plots severely and the superiority of muriate of potash over the sulphate of potash was really astonishing in affording protection from this disease. The muriate also gave a considerable immunity from "sand-drown" and produced a larger and better growth than the sulphate.

The special nutrition experiments were continued but with the addition of a new set of fields, Nos. 1 and 2, one on old land and the other on similar natured land but freshly cleared from the original forest. Samples of soil were taken from both fields for the purpose of obtaining the humus content. This experiment will be repeated at intervals in future years in order to learn the changes that take place according to treatment with crops and fertilizers.

This year the most striking observation was the relative superiority of corn on the old land and contrasting superiority of tobacco in both yield and quality on fresh land.

The need for phosphoric acid was even more strongly manifested on the fresh land, the growth where this constituent was lacking being almost nothing on the fresh land, especially with the corn plats.

TOBACCO EXPERIMENTS AT GRANVILLE FARM

General Fertilizer Tests.—There are thirty-six regular fertilizer plats in this experiment. The object is to determine the best sources of nitrogen, phosphoric acid, and potash, and also the best combinations of these various sources. In 1920 ground limestone, used at the rate of two tons per acre, was applied on one-half of these plats, thereby making a total of seventy-two plats.

The indications are that the use of lime has added somewhat to the yields.

Special Potash Plats.—There were twenty plats used in this experiment for determining both the best source and quantity of potash per acre. The potash was applied in different amounts, ranging from nothing to 80 pounds per acre, with and without lime. The indications are that the use of around 40 pounds of potash per acre seems to be about right. While the muriate gave a larger yield than sulphate of potash, we are not sure as yet that we recommend muriate in preference to sulphate on account of quality of the tobacco produced.

Variety Tests.—Twenty-one so-called varieties were tested this year, among them being several hybrids which have shown some promise. There were, also, tested-out the new variety known as "Big Gem," "Make All," "Harrison's Pride," and perhaps known in different localities under two or three other names. It was found that this variety was more resistant to "leaf spot" disease than a number of the other varieties. It was found to make a splendid growth, but did not have the body and general character possessed by the Orinocos, Adcock, Gooch, of Warne. It does, however, show promise.

Rotations for Tobacco.—Several rotations have been followed. Conditions will always be a big factor in determining the proper rotation to adopt, but wherever it is possible a grass sod well prepared is an ideal crop to precede tobacco.

Tobacco After Cowpeas.—We have been planting tobacco after cowpeas in rotation with oats for nine years and have used no nitrogenous fertilizers under the tobacco. When topped low and the tobacco is cut, it has been found difficult to get color and quality, but since we have been priming and planting twenty-four inches in the drill, splendid color with an average yield of about 1,100 pounds has been secured. While this is not always a safe rotation, it, when used intelligently, may give good results, especially if wire-worms are not present.

Closer Planting Combined With More Intensive Fertilizing.—Twelve plats ranging from 2,920, 4,704, 5,880 and 7,840 plants per acre were used. This covers spacing, with 4-foot rows, of 18 inches, 24 inches, 30 inches, and 36 inches apart in the row. Each distance of planting was fertilized with 450 pounds, 750 pounds, 1,000 pounds respectively of 5-8-5 fertilizer per acre. The results thus far secured are fairly conclusive in showing that an increased yield with good quality may be obtained by planting closer, say an average of about twenty-four inches in the row with four-foot rows, provided liberal applications of fertilizer are used.

Permanent Tobacco Seed-Bed.—It has been found possible to maintain a permanent seed-bed located at some convenient place near the house, provided steam is used each year to sterilize it. Where a farmer has a small portable boiler it is easy to make a pan and use this boiler for such purposes.

Nutrition Experiments.—In this experiment there are ninety plats, thirty of which are grown in tobacco, thirty in cotton, and thirty in corn with different fertilizer treatments. After the cotton, corn and tobacco are harvested, these plats are seeded in wheat, oats and rye which gives a crop of wheat after tobacco, after cotton, and after corn, and the same with rye and oats. By this means it is possible to get the crop-effects of the three main crops for this section.

Relative Value of Legumes.—There are one hundred and thirty-three plats in this series of experiments. The object of the experiments is to determine the relative value of the most common legumes in tobacco growing. This is done by planting a certain number of these plats each year in these legumes, after which they are planted to tobacco, cotton and corn with similar fertilizer treatment for each crop. When these cultivated crops are harvested, wheat, oats, and rye are sown. We then get the crop-effects and the legume-effects on each of the succeeding crops. This is an extremely interesting and valuable experiment, but it will require several years to secure data that will be dependable.

RESULTS WITH NITRATE OF SODA ON COTTON WITH PIEDMONT SOILS

In carefully conducted field experiments by the division, nitrate of soda has proven to be one of the best paying of fertilizers in the production of cotton on "red lands" in the Piedmont section of the State. It is usually one of the cheapest forms of nitrogen on the market, it is readily available, and when properly used on clay and clay loam soils its nitrogen will not leach out much more rapidly than that in other commercial forms of nitrogen. In a seven years test at the Iredell farm, on red clay soil, a fertilizer having its nitrogen in the form of dried blood was applied to cotton at planting. On an adjoining plat a fertilizer of the same composition was used, except that the nitrogen came from nitrate of soda. Each of these plats received fifty pounds of nitrate of soda per acre as a side dressing. The plat having dried blood at planting, followed by a side dressing of nitrate made an average yield during seven years of 767 pounds of seed cotton per acre. The plat that got nitrate of soda, both at planting and later, made an average of 919 pounds of seed cotton per acre, the difference in favor of nitrate of soda being 152 pounds of seed cotton, which at 8 cents per pound (above the present price) is worth \$12.16. When we take into consideration the fact that the fertilizer containing nitrate of soda cost less than that containing dried blood, the difference is still greater. The difference in yield between the two treatments varied from year to year. One year the nitrate of soda treatment yielded 330 pounds above the other. The method of applying dried blood at planting and nitrate of soda later gave a higher yield than by using nitrate of soda both times only one year out of the seven, and then the difference was only twenty pounds. In many parts of the Piedmont section the growing season is short and in order to mature cotton properly it is necessary to grow an early variety, to plant early, and to keep the crop growing rapidly from planting till maturity. Nitrate of soda is available to the young plants as soon as it dissolves in the soil water, hence it helps them to get a quick start and so to beat the season. The stiff clay subsoils of the Piedmont hold the nitrate so that, while available, it does not leach out during the growing season as it might do with a coarse sandy soil with a sandy subsoil.

PROFITABLENESS OF USE OF FERTILIZERS ON WHEAT ON MOUNTAIN SOILS

For a number of years fertilizer tests have been conducted by the Division of Agronomy at the Buncombe Farm. As a result of these tests it has been found that the proper use of well-balanced fertilizer mixtures will pay well for the fertilizer applied. In fact, without the use of a good mixture the growth of wheat is a doubtful crop, under normal conditions, from the standpoint of net returns per acre above the cost of production. What the amount per acre and proportions of plant

food constituents should be for this crop is indicated by the resume given below of our results on fairly typical bottom-land and upland soils of the mountain section of the State.

On Toxaway Loam (bottom) Soil.—(1) With only two constituents used phosphoric acid combined with potash afforded the largest net returns per acre, while nitrogen combined with potash failed to return enough to pay for the fertilizer application. The use of nitrogen and phosphoric acid averaged \$4.56 more profit per acre than did the use of nitrogen and potash, but it was not so great in the former case by \$8.26 as that secured on an average by the use of phosphoric acid and potash combined. With the use of a combination of nitrogen, phosphoric acid and potash, a net return per acre above the cost of fertilizer of \$12.35 was secured. This is forty-seven cents less than was obtained where a mixture of phosphoric acid and potash was used. Taking all results of the experiments from the different combinations, the evidence is quite conclusive that phosphoric acid is the dominant or controlling constituent of plant food for increasing the yield and profit in growing wheat on this type of soil.

(2) Lime when used alone has been found to give a small increase in yield and a profit after paying for itself. In combination with a complete fertilizer it has shown an annual increase in profit of \$18.23 per acre above the net returns secured by the use of a complete fertilizer alone.

Under the conditions of the experiment, the results show that for wheat grown on this type of soil lime may be used at a small profit alone, and with a much greater profit when applied in conjunction with a complete fertilizer.

(3) The amount of nitrogen used in the normal fertilizer (400 pounds per acre) applied in the experiments was three per cent or 12 pounds to the acre. This amount was varied so as to give 6, 12, and 24 pounds of nitrogen per acre. The yields of wheat and straw were very slightly increased as the applications of nitrogen were made larger, but in no case did the gains amount to enough to pay for the increased cost of the fertilizer over the normal amount of nitrogen. In fact, with the use of even 6 pounds of nitrogen not enough gain in yields was made to give as great a net profit as when phosphoric acid and potash was used without nitrogen.

Until other crop-producing factors are controlled the use of nitrogen for wheat on this type of soil does not pay.

(4) The amount of phosphoric acid in the normal fertilizer (400 pounds per acre) was 7 per cent, which is equivalent to 28 pounds per acre. This quantity was varied so as to apply 14, 28, and 56 pounds of phosphoric acid per acre with normal amounts of nitrogen and potash.

The yields of grain and straw were increased considerably as the amount of phosphoric acid was increased. The net returns secured per acre were \$4.94 when 14 pounds of phosphoric acid were used; \$12.35

by the use of 28 pounds; and with the use of 56 pounds a net return was made of \$25.93 above cost of fertilizer applied. From the increase in yield and net returns made, the use of 56 pounds of phosphoric acid was found the most profitable amount to use. It is indicated by the results from the use of 14 pounds to 56 pounds of phosphoric acid that even heavier applications of phosphoric acid would be more profitable.

(5) The amount of potash in the normal fertilizer (400 pounds per acre) was $1\frac{1}{2}$ per cent, equivalent to 6 pounds per acre. This amount was varied so as to apply 3, 6 and 12 pounds of potash per acre with normal amounts of nitrogen and phosphoric acid. The results indicated that 3 pounds of potash is enough to use for wheat on this type of soil. With the use of larger applications of phosphoric acid, more potash could probably be used with profit.

(6) Varying the amounts of the normal fertilizer applications from 200, 400, 600, and 800 pounds per acre gave progressively increased yields and profits as the quantity of fertilizer was made larger, the results being quite uniform in this regard. The results of the various applications after deducting the cost of the fertilizer showed the following net profits:

200 pounds of fertilizer per acre gave a profit of.....	\$ 4.60
400 pounds of fertilizer per acre gave a profit of.....	12.35
600 pounds of fertilizer per acre gave a profit of.....	34.36
800 pounds of fertilizer per acre gave a profit of.....	39.67

Putting this in a slightly different way, the first 200 pounds of fertilizer yielded a net profit of \$2.30 for each 100 pounds of fertilizer; the application of 400 pounds yielded \$3.09 per 100 pounds; 600 pounds yielded \$5.73 profit per 100 pounds; and 800 pounds yielded \$4.96 profit per one hundred pounds of fertilizer applied.

(7) From the chemical analyses of the various bottom land studied in the western part of the State the indications are that these results will apply generally to these soils.

(8) In the production of wheat on bottom-land soils, of the character of this, taking all results here reported as a whole, it is recommended that on well prepared land that at least 600 pounds of fertilizer per acre be used, analyzing about 10 per cent available phosphoric acid and something like 1 to 2 per cent nitrogen. It should be the plan of every farmer to reduce the necessity for the use of nitrogen in the fertilizers used. This can be done by the growth and plowing in of leguminous crops and crop residues grown in rotation with the wheat.

Porter's Loam (Upland) Soil.—(1) Nitrogen when used in normal amounts (12 pounds per acre) alone did not produce enough increase to pay for the material.

(2) Using a normal amount (28 pounds) of phosphoric acid alone gave a net profit of \$10.68.

(3) With a normal amount of potash (6 pounds) a net profit of \$5.78 was secured.

(4) With the use of a mixture carrying normal amounts of nitrogen and phosphoric acid, and no potash, after paying for the fertilizer a net profit was obtained of \$7.82.

(5) With normal amounts of nitrogen and potash, and no phosphoric acid used in the mixture, the increase in yield was barely sufficient to pay for the fertilizer.

(6) By the use of phosphoric acid and potash, leaving out nitrogen, a net gain was made of \$6.77.

(7) Using all three plant-food constituents combined in a complete fertilizer an increase in yield was secured sufficient to give a net profit of \$9.68. Although the average yield from this plat was larger than from that to which phosphoric acid alone was applied, the increased yield is not enough to compensate for the increase in the cost of fertilizer.

(8) The results show that the use of lime alone has given increased yields and profits, and when used in combination with a complete fertilizer a small net profit has been secured over that when a complete fertilizer alone had been used.

(9) The experiments as a whole show, first, that phosphoric acid is the controlling plant food constituent for increasing yields and profits in growing wheat on this type of soil; second, that unless more phosphoric acid is applied the use of nitrogen and potash will be made at a loss; and third, that lime can be used with profit.

(10) The amount of nitrogen in the normal fertilizer (400 pounds per acre) applied in the wheat experiments was 3 per cent or 12 pounds to the acre. This amount was varied so as to give 6, 12, 24 and 36 pounds of nitrogen to the acre. With the exception of the plat which received the heaviest application (36 pounds) of nitrogen, giving a net profit of 18 cents more than did the plat receiving the lightest application (6 pounds), the profits decreased as the applications of nitrogen were increased. The results indicate that, until other conditions are satisfied, it is not profitable to use larger amounts of nitrogen than 6 pounds per acre in the production of wheat on this type of soil.

(11) The amount of phosphoric acid in the normal fertilizer (400 pounds per acre) was 7 per cent of 28 pounds per acre. This quantity was varied so as to apply 14, 28, 56 and 84 pounds, respectively, of phosphoric acid per acre. The largest and most profitable yields were secured from the use of 56 and 84 pounds per acre with normal amounts of nitrogen and potash. As the use of 84 pounds just barely paid for itself, it is probable that until other conditions are satisfied 56 pounds of phosphoric acid are enough for profitable wheat growing on this type of soil.

(12) The amount of potash in the normal fertilizer (400 pounds per acre) used, was $1\frac{1}{2}$ per cent or 6 pounds per acre. Varying this amount so as to apply 3, 6, 12 and 18 pounds per acre, respectively, the results show that for the use of 3, 6, and 18 pounds the net profits are practically the same. For some reason the results secured with the use of 12 pounds are very high. Until other conditions are satisfied it is probable that 3 pounds of potash is enough to use for wheat on this type of soil.

(13) Varying the amounts of normal fertilizer application from 200 pounds to 400, 600, 800 and 1,000 pounds per acre gave increased yields and profits for all the applications except where 800 pounds were used. The most profitable application was at the rate of 1,000 pounds per acre of the normal mixture. After deducting the cost of the fertilizer, the different quantities per acre showed the following profits:

200 pounds per acre of fertilizer gave a profit of.....	\$ 3.55
400 pounds per acre of fertilizer gave a profit of.....	7.04
600 pounds per acre of fertilizer gave a profit of.....	11.11
800 pounds per acre of fertilizer gave a profit of.....	10.56
1000 pounds per acre of fertilizer gave a profit of.....	13.50

Putting this in a slightly different way, the first 200 pounds of fertilizer yielded a net profit (after paying for cost of fertilizer) of \$1.78 for each 100 pounds of fertilizer; the application of 400 pounds yielded \$1.76 per 100 pounds; 600 pounds yielded \$1.85 per 100 pounds; 800 pounds yielded \$1.32 per 100 pounds and 1,000 pounds yielded a profit of \$1.35 per 100 pounds of fertilizer.

(14) From the chemical analyses of the various upland soils in the western part of the State the indications are that the results herein given will apply very well to most of them.

(15) In the growth of wheat on average unmanured upland soils of the mountains, properly treated, taking all results as a whole, it is recommended that something like 600 pounds per acre of a fertilizer analyzing about 10 to 12 per cent phosphoric acid and 2 to 3 per cent of nitrogen be applied. When soils of this character are built up, the nitrogen in the mixture may be reduced or be entirely eliminated. This condition of the soil should be striven for by the growth and plowing into the soil of leguminous crops and crop residues.

CROP ROTATION

In most of our soil fertility studies a definite system of crop rotation is being and has been used for many years. Good rotations with legumes have been studied against single and double rotations without legumes. The results have developed many facts of interest and importance to farmers of the State. This work is being continued in most of the experimental work with our main crops on the different soil types of different parts of the State. It is feared that many have not realized

even yet the value of good crop rotation in which suitable legumes are included wherever practical to do so. In this connection it might be mentioned that at the Central farm in eight years a five-year rotation constituted as follows has been followed:

First year—Soybeans sown broadcast and turned in.

Second year—Cotton, followed by rye.

Third year—Rye plowed in, followed by corn, ears gathered and stalks turned in.

Fourth year—Soybeans for hay.

Fifth year—Wheat, followed by soybeans.

And where two soybean crops have been grown and turned under the yields of the main money crops have been at least quadrupled. For the average general farmer the only way in which he can increase the organic or humus supply of his soil in the most practical way will be by the plowing in of crops and crop residues.

INVESTIGATIONS IN PLANT BREEDING

Cotton Study Work at Central Farm.—The cotton study work under Adams project No. 14 has been continued and has consisted of further comparisons of several strains isolated from one variety and their first generation hybrids. The strains of cotton isolated in 1913, and self-fertilized since that time, have shown no loss of vigor due to breeding. The strains are very uniform and distinct in character. During the past six years strain No. 29 has averaged 2061.78 pounds of seed cotton per acre, while No. 22 as inferior strain has averaged only 985.1 per acre.

Seven of the more distinct pure lines were inter-crossed last season. When the first generation plants were grown this season they proved to be more vigorous and earlier than either of their parents. In each case the first generation hybrids were more productive than either of their parents.

The Place-Effect Studies under Adams project 15 have continued to consist of a further comparison of cotton plants from Mississippi and North Carolina grown seed of the same pure strain. The work is conducted in coöperation with the Mississippi Experiment Station. The seed from the two sources have been planted in alternate rows and notes have been taken of the number of blooms at the beginning of the blooming period; the height of plants at blooming time; number of bolls set and open bolls at intervals; and the height of plants at maturity. During three previous seasons, the Mississippi-grown seed have given earlier, taller and more productive plants when grown here than the North Carolina-grown seed. Similar results were gotten from the studies in the two localities at the Mississippi Agricultural College, and at West Raleigh, N. C. This season, the fourth year of the experiment, the seed have been grown again in the two localities, the

results having reversed themselves in the North Carolina series. This year in this series, the North Carolina-grown seed have given earlier, slightly taller and more productive plants.

SEED IMPROVEMENT ON THE BRANCH STATION FARM

In order to supply growers of the State with productive farm seeds of good quality, all of the branch stations are being stocked with good strains of the different field crops. Among the crops being improved at the present time are cotton, corn, wheat, oats, soybeans and vetch.

The Mountain Branch Station has been stocked with a good strain of Biggs' corn, and of strain No. 38 of the Haberlandt soybeans. The Biggs' corn has furnished a source of good seed corn to farmers for that section during the past three years. Strain No. 38 of the Haberlandt soybeans were a little too late for the bottom-lands on this farm this season. The growth of the strain will be continued on higher and lighter soils during next season.

The Piedmont Branch Station has been stocked with King No. 29 cotton seed, Pedigreed Weekley's Improved corn, Leap's Prolific No. 32 wheat, pedigreed Virginia No. 11 soybeans, and pedigreed Abruzzi rye. Seed of these crops have been increased now sufficiently to plant the entire crop of the farm in pure-bred seed. The surplus seed are being sold to growers of that section of the State at reasonable prices.

The Central Branch Station is now stocked with pure seed of King No. 29 and Mexican Big Boll cotton, Cook's Prolific corn, Leap's Prolific No. 12 wheat, Mammoth Yellow soybeans No. 101, Haberlandt soybeans No. 38, and Virginia soybeans No. 11. The Mexican Big Boll No. 6 cotton selected on the Central Station farm has ranked first in earliness and quality of staple in all of the tests made during the past season. In three of five tests, it has taken first place in yield of seed cotton per acre. When all of the results are in, it may make an even better showing. During the past season, sufficient pure seed have been produced and saved to plant the entire crop at the Central Station farm during the next season. This strain of Mexican Boll will be used to replace the strain of King No. 29 previously grown on this farm. The pedigreed Leap's Prolific wheat No. 12 was increased sufficiently this season to sell 262 bushels to growers of the State. The seed was sold to thirty-eight growers in twenty-two counties. These growers should furnish enough good seed wheat next year for their different communities. Selection No. 101 from the Mammoth Yellow soybean has averaged 5.2 bushels per acre more than the general crop of Mammoth from which it came. Selected strain No. 11 from Virginia has averaged two bushels per acre more than the original seed, and strain No. 38 of Haberlandt soybean averaged 6.3 bushels per acre more than the general crop seed during the past four years. Seed of these high yielding strains are being established as rapidly as possible in sections of the State where they are best adapted.

The selection work with Mammoth Yellow soybeans to increase the oil content during the year has been continued. The selected strain which has furnished the largest oil content has unfortunately remained low in yield. Strain No. 101 has continued to give the largest yield of seed and of oil per acre, though its oil content has averaged 1.1 per cent lower than that of the unselected Mammoth Yellow beans planted as a check.

At the Coastal Plain Branch Station, the cotton and corn improvement work previously mentioned has been continued. Through careful selection, Mexican Big Boll cotton has been reduced to a uniform strain and is gradually becoming a favorite variety in the community. If the farm was supplied with a private gin, better seed could be produced which could be sold from the crop in the future. This strain of Mexican is earlier and more uniform than the original strain. In several cases it has yielded more than Cleveland and furnished a staple of much better quality.

The high yielding strain of Mammoth Yellow soybeans, No. 101, has been planted at the Coastal Plain Station to supply the surrounding community with a better yielding strain of this crop than is now being grown in that section.

At the Tobacco and Black-land Branch Station, selections have been made to improve the quality and yield of corn grown on them.

COMMUNITY COTTON IMPROVEMENT WORK

This work was continued during the year with communities already organized, new work having been started with six other communities in six different counties. With the new work started this season, twenty-four counties have received aid in this work. It has reached directly more than 800 growers and influenced them to plant seed of the more improved varieties of cotton best adapted to their different sections. As noted by correspondence and by observations with leaders in communities where tests have not been made, many times the above number have been influenced indirectly to grow the better varieties of cotton. During this season, more than 75,000 bushels of pure seed of improved strains will be grown under the supervision of the Division of Agronomy. This work has increased the interest of the progressive farmers in securing good seed from breeders and in keeping it pure and high yielding by saving good seed in the field and using more care in the handling and ginning of seed cotton.

So favorably has the work impressed the growers of Edgecombe County that eight of its most progressive growers have engaged the services of an expert plant-breeder to devote all his time next year in selecting seed of all of their main crops and in otherwise improving their crop yielding powers.

Since the cotton community work was started in 1914, fifty-six communities have been supplied with improved seed. In all except one community, the improved strains recommended by the Division of Agronomy have produced a larger money value per acre than the varieties generally grown in the community. The improved strains have yielded increased yields to the value of from \$5.00 to \$60.00 per acre more than the unimproved varieties commonly grown in the communities, and in all of the tests conducted during the past five years the improved strains have averaged \$28.97 per acre more in value than the varieties previously grown in the communities.

LONG STAPLE COTTON FOR NORTH CAROLINA

During the past two years considerable interest has been shown in the growth of long staple cotton. This has been due to a large extent to the increased price offered for this cotton. A few growers of the State have grown long staple cotton successfully for several years, while many others have been disappointed after one year's experience. The disappointments have usually come from the use of poorly bred seed and the lack of a long staple market. Since the value of long staple cotton is dependent upon its length and uniformity, it is very essential to use pure bred seed. Isolated growers have found it very difficult to get the true market value of their long staple cotton, and even large growers have found it necessary to sell at lower prices than prevailed on other markets in other localities.

A few growers are of the opinion that recently improved long staple cottons yield equally as well as the short staple varieties. In order to furnish reliable information on this matter, the results of thirteen cotton variety tests conducted in the Coastal Plain section are given below. In each case the highest yielding short staple variety and the highest yielding long staple variety have been compared. The short staple varieties have averaged 572.6 pounds of lint and 925.2 pounds of seed per acre, while the long staple of $1\frac{1}{4}$ inch quality yielded 364 pounds of lint and 705.7 pounds of seed per acre. As will be seen, the short staple cottons have averaged 208.6 pounds of lint and 219.5 pounds of seed more per acre than the long staple varieties. With this difference in yield, the $1\frac{1}{4}$ inch cotton should bring 32 cents per pound for lint when the short staple cotton is selling for 20 cents in order to give the same returns per acre. When short staple cotton is selling for 30 cents, the $1\frac{1}{4}$ inch cotton should sell for 48 cents in order to bring the same returns per acre. These differences in price only take into account the differences in yield. Pure planting seed of the long staple varieties usually will cost more to maintain than will those of the best short staple varieties. If one goes to the trouble of selecting his own seed each year, it will require much more time to keep the long staple varieties uniform and productive than would be required for the short

staple variety. It is estimated that at least two cents per pound should be added, therefore, to cover the extra cost of producing the long staple cotton and keeping it pure. With this addition to the difference in yield $1\frac{1}{4}$ inch cotton should sell for about 34 cents per pound when short staple sells for 20 cents; or 50 cents when the short staple is selling for 30 cents.

SOYBEAN IMPROVEMENT

Four varieties and five pedigreed strains of soybeans have been distributed in sections of the State where they are best adapted. Special efforts have been made to interest the growers of the Piedmont and mountain sections to grow more soybeans. Strain No. 101 from Mammoth Yellow has proven a high yielder in the eastern Piedmont and Coastal Plain sections. Strain No. 38 from Haberlandt and No. 11 from Virginia have given unusually good results in the Piedmont and mountain sections. Special soybean campaigns were conducted during the year in Bladen, Person and Columbus counties. Similar work was arranged for in other Piedmont counties, but had to be cancelled on account of the influenza epidemic.

COMMUNITY CORN IMPROVEMENT

During the past season thirteen communities have been given aid in the selection of seed corn. The Cherryville Community Test and Corn Show of Gaston County was one of the most successful during the year. This work was conducted in coöperation with the First National Bank of Cherryville, and has been very satisfactory in arousing the farmers' interest in the importance of good seed. This season the best varieties of the community were included in a variety test in order to decide upon the one best variety for the community. Mr. Garren spent one week in Iredell County giving demonstrations in the selection of seed corn in the field. This work is planned to be encouraged and special stress to be given to the selection for uniformity and high yield.

COMMUNITY WHEAT IMPROVEMENT

During this fall 340 bushels of pedigreed Leap's Prolific wheat were distributed to thirty-eight growers in twenty-two counties. This pure seed should furnish sources of good seed to the communities in which they live. In six communities wheat variety tests are being conducted this season to compare the improved strains with varieties commonly grown in the communities.

FIELD-CROP CULTURE EXPERIMENTS

At the Piedmont Branch Station farm the rate and date of seeding wheat and oats have been continued. From a five-year average the best dates for seeding wheat have been shown to lie between October 15 and November 1. Six pecks per acre proved the best rate for wheat, when the seeding was made between October 15 and November 1.

According to the results from the date of seeding tests, the growers of this section are reducing their possible yields two to six bushels per acre by planting ten days to three weeks too late.

Similar experiments have been conducted with oats. The best dates for seeding oats have ranged between October 1 and 15, and a rate of seeding of eight pecks has given the best results. Seeding of oats made as early as September 1 or 15 were badly damaged by rust, and were more severely injured by cold than later plantings.

During the past season two distance tests of cotton were started, one on the Central and the other on the Coastal Plain Branch Station farm. The results from these tests have not been completed.

SOIL AND CROP EXTENSION WORK

Some extension work in agronomy was done in this State during November and December, 1919, by S. L. Jeffords, who was with us for only a short time. E. C. Blair took up this work in July, 1920. For the time between the period of Mr. Jefford's leaving and Mr. Blair's assuming of the duties of Extension Agronomist but little work was done along agronomic lines, except now and then by members of the regular staff, except as indicated elsewhere in this report.

The principal problems worked on have been to induce farmers by work in their community to increase their yields of the crops now being grown (a) by improving the soil; (b) by adopting good rotations; (c) by more efficient methods of culture; (d) and by the use of better seed. In some instances it has been considered advisable to recommend the growing of certain legumes for soil improvement, in addition to those already being grown on the farms.

Soil improvement is to be effected by the rational use of commercial fertilizers, by the use of lime in connection with legumes, and as far as practicable supplemented by the use of farm manures. A crop rotation of from three to five years is necessary in order to bring in legumes for adding organic matter to the soil. The introduction of new varieties of crops is often advisable and is being followed up by encouraging farmers to improve their seed by proper methods of field selection. All of the above problems have been attacked in a general way by going into counties and dealing with the problems of the county in meetings at school houses and on the farms of groups of farmers. Some demonstrations with crops and fertilizing materials have been conducted with splendid results.

The experiment station has conducted experiments in all parts of the State during the past many years and has available a large amount of practical information to take to farmers. This data relates to: the proper kind and amount of fertilizer for different crops in all sections of the State, the use of lime, rotations, cultural methods, variety tests

of all important crops, and seed improvement. The main problem now is to spread this knowledge among individual farmers and for them to utilize it to best advantage.

Some exhibits showing the results of field work have been arranged and made, showing the following:

(a) The effect of lime on red clover; by means of charts and enlarged photographs.

(b) The plant food content of principal North Carolina soils; by blocks of different sizes and colors, representing the amount contained in each type of soil.

(c) Seed of leading varieties of wheat, oats, cowpeas, and soybeans.

(d) Specimens of leading varieties of sorghums for different sections of the State.

This exhibit attracted considerable attention on the part of farmers.

Work has been done, since July 15, in the following counties: Lincoln, Buncombe, Orange, Davidson, Rockingham, Cabarrus, Davie, Stanly and Montgomery counties. From one to five days were spent in each county, working with the county agents among farmers on special agronomic problems of the farmers.

Demonstrations have been conducted mainly in seed selection, crop improvement, variety testing, fertilizer tests, use of lime for different crops, value of legumes in soil improvement and others.

Many samples of soil sent in by farmers have been examined and reports supplied on the deficiencies of the soils and how to best treat them for the best and most profitable growth of particular crops.

WORK WITH SUGAR PLANTS

The great variation in climatic conditions necessary to the successful production of different sugar plants compels the inclusion of practically all parts of the State in the work. This condition also makes it necessary that the work in connection with each plant be carried out in a somewhat different way from that of the others.

Stimulation of greater production and better quality of products is the principal problem with all the sugar plants, but with the sugar maple the problem also includes the creation of a sentiment favorable to the preservation of the old trees and to the planting of young ones.

Visits to the individual farmer in his home have proved more effective, generally, than public meetings, although a considerable number of public meetings have been held on the subject of sorghum sirup and cane sirup. The plan has been for the sugar plant specialist to spend from two days to a week with a county agent and go with him to such farmers as have shown, or are likely to show, an interest in these crops. The results secured in many cases have proven this to be a wise course to follow.

Many county agents have asked for the assistance of the sugar plant specialist, particularly in the matter of sorghum, but in some counties where sorghum possibilities are greatest as a money crop, it was found necessary to request the assistance of the county agent. In all cases, the county agents gave hearty coöperation when once their attention had been called to the importance of the crops and of the work.

A number of articles have been prepared for the Extension Farm News on sugar plant growing, which were used largely by the press of the State. The results of our sorghum variety demonstrations for 1919 were tabulated and published in Extension Circular No. 102. This publication has been extensively distributed as a result of a large number of requests from farmers of the State. In addition, special letters have been prepared and sent to owners of sugar-maple groves and to the press of the mountain counties with reference to sugar maples.

An unusually large number of letters have been written in answer to requests for information from farmers and others relative to one or more of the sugar plants. The great number of inquiries received shows the interest farmers of the State have in this work.

Sorghum.—This crop is the most important of sugar plants of the State at the present time, as it is grown to some extent for sirup purposes in almost every section of North Carolina. Last year the value of the sirup produced in the State was \$8,676,000, or about the same in value as the oats crop. In addition, the seed were worth many thousands of dollars, which would make the total value of the crop considerably greater than that of oats.

The possibilities for developing a valuable money crop in sorghum is exceptionally good, as the net profits from an acre should not be less than \$110.00, with possibilities of a net profit as high as \$225.00 per acre. The work with this crop for the past year has been carried out with the following objects in view: To show farmers the importance of planting seed of a pure variety whose juice is rich in sugar, so as to secure the maximum yield of sirup, and also that the variety should be suitable for the soil and climatic conditions of his locality; to secure a greater production by giving facts and figures to show the money value of the crop per acre; and to secure better equipment for working up the crop, thereby producing a better grade of sirup by more careful methods of manufacture.

Individual work along the above lines was carried on in about twenty-five counties of the State in coöperation with the county agents. The proper methods of determining the finishing point of sirup was stressed and many sirup-makers are now using the thermometer for this purpose. Attention was also called to the importance of using sanitary vessels for the sirup and of proper methods of canning and caring for the finished product.

Variety demonstrations to determine more fully the best varieties to grow in different sections of the State were again put out by the following: Buncombe Farm, Charles Lutz, Newton; Central Station, Raleigh; Charles J. Heath, Ernul, Waccamac Lumber Company, Bolton, and Thomas D. Hardin, Greensboro. The latter had to be abandoned, but from the other plats much valuable data has been gathered which will later be reported in tabulated form.

At all of these places assistance was given in making the sirup and a number of sirup-makers came to witness the demonstrations, especially in testing the finishing point of the sirup with the thermometer. The use of the thermometer by sirup-makers is now becoming quite general throughout the State and will bring a better and more uniform grade of product.

It is planned to continue the work with sorghum for next year along the same general lines as carried out this year.

Sugar cane.—This crop is grown in quantities sufficient to produce sirup for the home by many farmers in the Southeastern part of the State. This area includes all of the counties of Brunswick, Columbus, New Hanover and Pender; also the southern parts of the counties of Robeson, Bladen, Sampson, and probably the southern half of Onslow.

In this region sugar cane grows and matures as well as in states further South, and the sirup, when properly made, has as fine a flavor and rich color as is made elsewhere.

Efforts have been made to induce farmers to plant more extensively, with some success, but so far the sugar plant specialist has not been able to give this crop the attention its importance would seem to merit. From the nature of both the soil and the climate, there seems to be a splendid opportunity to build up a valuable cane sirup industry in this part of the State, and more careful demonstrations should be made in the near future to determine the limits of these possibilities.

Sugar beets.—The work with this plant has been continued to determine the localities in which this crop may be profitably grown, either as a commercial crop or for feeding purposes. Seed was not so widely distributed last spring as in preceding years, but was given to selected farmers in sections of the State where previous results seemed to indicate there was more promise. Some fourteen or fifteen plats of from one-eighth to one-fourth of an acre each were planted in Rowan, Forsyth, Henderson, Transylvania, Buncombe, Watauga, Jackson and Swain counties. Beets from these plats will be tested for sugar content. At this time all the plats have not been checked, but what have been visited show a crop, so far as size of beets and tonnage per acre is concerned, above the average of that of the Middle West. The indications are for a high-sugar content, but the analyses can be depended upon alone to determine this. Plans are already under way for more careful and thorough demonstrations next year in connection

with the Hendersonville Board of Trade and with citizens of Jackson County, as well as with some of those elsewhere who grew beets this year.

Sugar maple.—Circular letters were sent out early in the year to all owners of sugar maple groves whose names we have listed, in which they were urged to preserve their trees and to produce sugar and sirup. Personal interviews were held during the year with a considerable number of owners of groves in which the advantage of preserving their trees and utilizing them for sugar and sirup-making purposes were set forth. Some gratifying results of this work have come to our notice in the greatly increased tendency to preserve groves intact in certain localities and in the greater production of maple sugar and sirup during the last season. More groves were operated and more sugar and sirup produced than at any period during a long series of years.

The time at the command of the Sugar Plant Specialist and the slowness of travel in the best sugar maple communities has made it impossible to gather very reliable data on the amount produced, but it can safely be said that it was at least double that of any preceding year in the last thirty or more years. Unfortunately, almost all orchards were operated with old-type equipment and under old and wasteful methods. It is a hopeful sign, however, that at least two, and possibly three or four orchards, have been provided with modern equipment in full during the last two years. These, and particularly the one at Grandfather Orphanage, Banner Elk, will prove valuable as demonstrations of the better quality of sugar and sirup that can be secured from proper equipment.

Altogether the outlook for increased production of maple sugar and sirup and for the preservation of the trees is very encouraging. If continued attention is given to the matter and assistance and encouragement given the owners of groves, there will soon be such a sentiment for preserving them as will preclude such destruction as has been going on for some years past. Preservation of the groves will bring about a greatly increased production of sugar and sirup.

USE OF BETTER METHODS ADDS MILLIONS TO THE VALUE OF CROPS OF STATE

A study of yields and values of the crops of the State show what has been accomplished by North Carolina farmers in the way of the use of better methods in crop production. There has been a steady increase in the yields of corn, wheat, oats, cotton, and tobacco for the ten-year periods of the last forty years. These increases have been brought about largely by the use of better methods of fertilization, by the use of more productive strains of field crops, by employing better seeding and cultural methods, and by the more general use of crop rotations, in

which legumes are grown and used in part at least after their growth for soil-improvement purposes.

A study of the statistics show that these increases for North Carolina for the ten-year period 1910-1919 over the ten-year period 1880-1889 had in 1918 a farm value of \$38,614,320 for corn, \$8,297,940 for wheat, \$2,624,400 for oats, \$46,928,024 for cotton (lint and seed), and \$26,611,416 for tobacco; and in 1919, \$38,628,000 for corn, \$7,231,854 for wheat, \$2,764,692 for oats, \$56,041,920 for cotton (lint and seed), and \$48,104,928 for tobacco.

From these figures it may be seen that the increased yields of these five major crops of the State by the use of better methods brought to the farmers of the State, when the crops were sold from the farm, \$123,076,100 in 1918 and \$152,771,294 in 1919.

As will be seen, the value of these average increased yields of the five major crops for the last decade over the ten-year period, 1880-1889, were in 1919 worth slightly more than one-third the total value (\$540,000,000) of the eleven leading crops of the State; slightly more valuable than all the livestock, including work stock (\$145,000,000); and a little more than seventeen times the amount of money spent by the State, cities, towns and counties of North Carolina for elementary, secondary and higher education, altogether (\$8,839,282). This is, indeed, a very good showing for North Carolina farmers and is one that we should be proud of. It should not be overlooked, however, that our yields are still low and there is much to be done by us in securing increased yields from the use of better methods of crop production in the future. The general use, by a majority of the farmers of this State, of better methods of fertilization, of seed selection, of better seeding and cultural methods, and of rotation of crops, would, under normal conditions, no doubt increase the yields of our crops at least 50 per cent over what they are at present during the next ten years in North Carolina. It must be realized by all thoughtful people that the economic production of crops lies as the very bed-rock of the prosperity of not only our farmers but of all other classes of our people.

PUBLICATIONS

During the year the following publications have been prepared by the Division of Agronomy and published from the funds indicated below:

BULLETINS

1. Control of Cotton Anthracnose and Improvement of Cotton. (State Department of Agriculture—January, 1920.) Written in cooperation with the Division of Plant Pathology.
2. Farm Practices with Soybeans (State Department of Agriculture—April, 1920.)

3. Relative Value of Acid Phosphate and Rock Phosphate on North Carolina Soils. (State Department of Agriculture—June, 1920.)

4. Fertilizer Experiments with Wheat on Mountain Soils. (State Department of Agriculture—July, 1920.)

CIRCULARS

5. Sweet Sorghum Variety Demonstration. (N. C. Extension Service Circular No. 102.)

6. Improved Seed Wheat for North Carolina. (N. C. Extension Service Circular No. 106.)

7. Community Cotton Improvement in North Carolina. (N. C. Extension Service Circular No. 108.)

In closing this report, I wish to commend all those associated with me in the agronomic work for their loyal and faithful performance of duty.

Respectfully submitted,

C. B. WILLIAMS, *Chief, Division of Agronomy.*

REPORT OF THE DIVISION OF BOTANY

To the COMMISSIONER OF AGRICULTURE.

SIR:—Permit me to submit herewith the annual report on the various lines of work of the Division of Botany from December 1, 1919, to December 1, 1920.

WORK OF SEED LABORATORY

During the past year over 1,700 samples of agricultural and vegetable seeds were examined in our seed laboratory, an increase of more than 100 over 1919. Of this number over 400 samples were vegetable and over 1,300 agricultural seeds. In addition to the above, we re-cleaned tobacco seed for sixty-nine different farmers who sent in 175 pounds in all. Of this 175 pounds 125 pounds were returned clean. This amount of tobacco seed, if made to do its full duty, would produce enough plants to set 36,000 acres of tobacco.

The work of the seed laboratory has increased from 732 samples of agricultural and vegetable seeds in 1913 to 1,747 samples in 1920; and from no re-cleaned tobacco seed in 1913 to enough to plant 36,000 acres in 1920.

A glance at Table V of our seed report will show that a more viable seed of the grasses and clovers has been put out by the seedsmen during 1920 than was put out by them in 1918 or in 1919. As it is the mission of the Botany Division to encourage the sale and use of only the best grade of seed, this steady increase in the quality of seed sold on the market is a source of gratification.

LEGUME CULTURES

The demand for legume cultures continues strong. Most farmers who used these cultures continued to purchase and many new customers are coming in each year. Over 2,600 acre bottles have been distributed to date.

GRAIN GRADING SERVICE

Our laboratory for placing the Federal grades on corn, wheat, and oats is now fully equipped and we have already been called on to grade samples of wheat sent in by the millers. The demand for this line of service will surely grow as it is recognized as of great importance to the millers and wholesale grain dealers of the State. The following letters show in what esteem this line of work is held by those who expect to be directly benefited by it:

“Wilmington, N. C., September 30, 1920.

MR. J. L. BURGESS,

Raleigh, N. C.

DEAR SIR:—

Have your valued favor of the 28, which we have read with interest. We note your Department has been licensed by the United State Department of

Agriculture. We will observe your instructions as to forwarding samples for grading when we desire such work done.

In our judgment, this is one of the best moves the State has ever made and we feel sure it will result that way. You can rest assured we will coöperate in every way with you.

Very truly yours,
BROWN BROTHERS (*Merchant Millers.*)”

“Durham, N. C., September 30, 1920.

MR. J. L. BURGESS,
*North Carolina Department of Agriculture,
Raleigh, N. C.*

DEAR SIR:—

We have your favor of the 28, and beginning with October first we will mail you samples for inspection, which have previously been going to Baltimore.

Thanking you, we are,
Yours truly,
AUSTIN-HEATON COMPANY, (*Merchant Millers.*)”

“Durham, N. C., October 1, 1920.
*N. C. State Department of Agriculture, Raleigh, N. C.
Attention of Mr. J. L. Burgess*

GENTLEMEN:—

We are mailing you this afternoon by parcel post two samples of wheat for inspection. One of these samples was drawn from AA car 11302, shipped us on September 16, by the Snyder Mfg. Company of Chillicothe, Ohio. The other sample was drawn from C. N. car 84536, shipped us on September 18, by D. M. Wertz & Company, Quincy, Pa. Kindly let us have your inspection on these two cars as early as possible and greatly oblige.

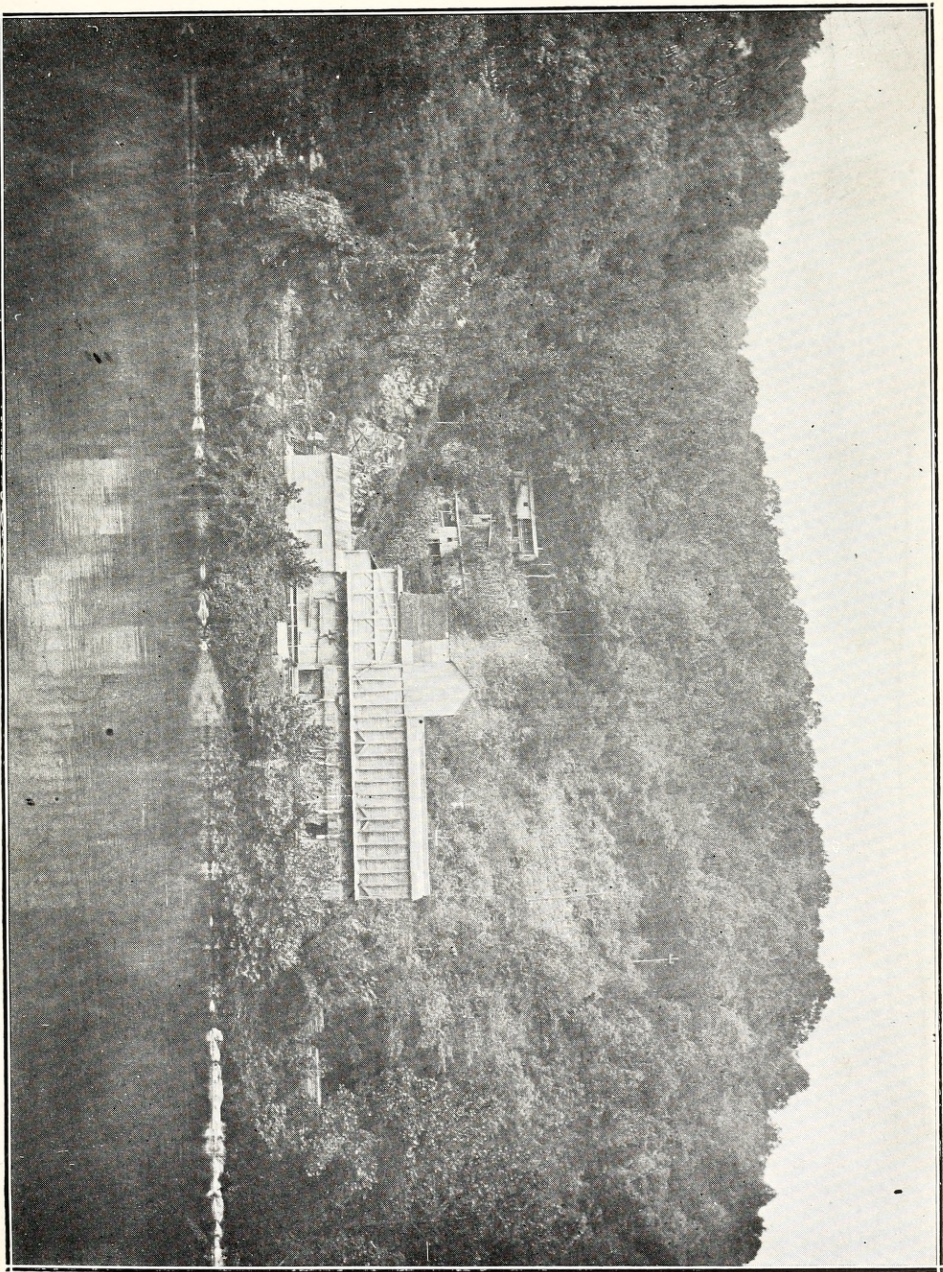
Yours truly,
AUSTIN-HEATON COMPANY, (*Millers.*)”

Farmers as well as millers and wholesale grain dealers should take advantage of this opportunity to have the market grades placed on their grain before selling.

LIME DISTRIBUTION

Our Tennessee lime plant is now fully equipped with two pulverizers, one air compressor for drilling, one gyratory crusher, three motors, storage bin and so on. Our electric power continues poor and during the summer and fall car shortage was so serious that we were about to shut down the plant, but the lime committee felt we would better keep running but with a greatly reduced force.

Delays in getting our new equipment—new pulverizer, new motor, and new flexible couplings, followed by an unprecedented car shortage—week after week passed without a single car being placed at our plant—have resulted in our not shipping more than one-third the number of tons of limestone we would have shipped had conditions been normal. To date we have distributed 2,408 tons since May 15th, while we should have been able—with a fully equipped plant—to ship at least 6,000 tons.



NORTH CAROLINA STATE LIME PLANT, BRIDGEPORT, TENNESSEE
(Looking southeast across French River)

LIME PROPAGANDA

The commercial lime grinders and the State demonstration agents, led by this department, have launched an unprecedented movement for the use of limestone. We have not been able to fill nearly all the orders that came to us and we have been assured by the commercial grinders that they have, also, been swamped with orders. The farming interests over the entire State—from the mountains to the sea coast—are rapidly coming to see the value of lime in agriculture. And why? Because, when once used, the good results lead, inevitably, to a continued use. Its use on the clover crop and other legume crops give phenomenal results, and its use in combination with a complete fertilizer has proved to be of especial importance in increasing the availability of the fertilizer.

In bulletins Nos. 220 and 265 we emphasized the fact that limestone mixed with acid phosphate would prolong and increase the availability of the phosphate. We also suggested fertilizer formulas in which limestone entered largely into the composition of a complete fertilizer. This idea of mixing limestone with any kind of fertilizer seems to have been rather novel, and was sharply condemned by a number of honest thinkers in agriculture. The idea has, however, gradually worked its way into our farm practice and is becoming more and more appreciated. Practical farmers find it pays handsomely to mix their fertilizer with limestone, and the test farms of the State have put the matter to scientific test with the following results at the Buncombe Farm:

"Lime when used alone has been found to give a small increase in yield and a profit after paying for itself. IN COMBINATION WITH A COMPLETE FERTILIZER it has shown an annual increase in profit of \$18.23 per acre above the net returns secured by the use of a complete fertilizer alone.

Under the conditions of the experiment the results show that for wheat grown on this type of soil, lime may be used at a small profit alone, and with a much greater profit when applied IN CONJUNCTION WITH A COMPLETE FERTILIZER. (Copied from Extension Farm News, July 28, 1920.)"

And with similar results at the Iredell Farm:—

"At the Iredell Experiment Farm in 1920 lime added to a complete fertilizer more than doubled the yield of hay.

"Lime added to a fertilizer carrying nitrogen and phosphoric acid increased the yield of clover hay about seven times over a mixture of nitrogen and phosphoric acid.

"Lime added to a fertilizer application carrying phosphoric acid and potash increased the yield a little over six times more than what was secured without the lime.

(Signed) C. E. WILLIAMS."

Like results are reported from the Oxford Farm also. There is, therefore, no more room for doubt of the correctness of the statements contained in Bulletin No. 220, and in Bulletin No. 265.

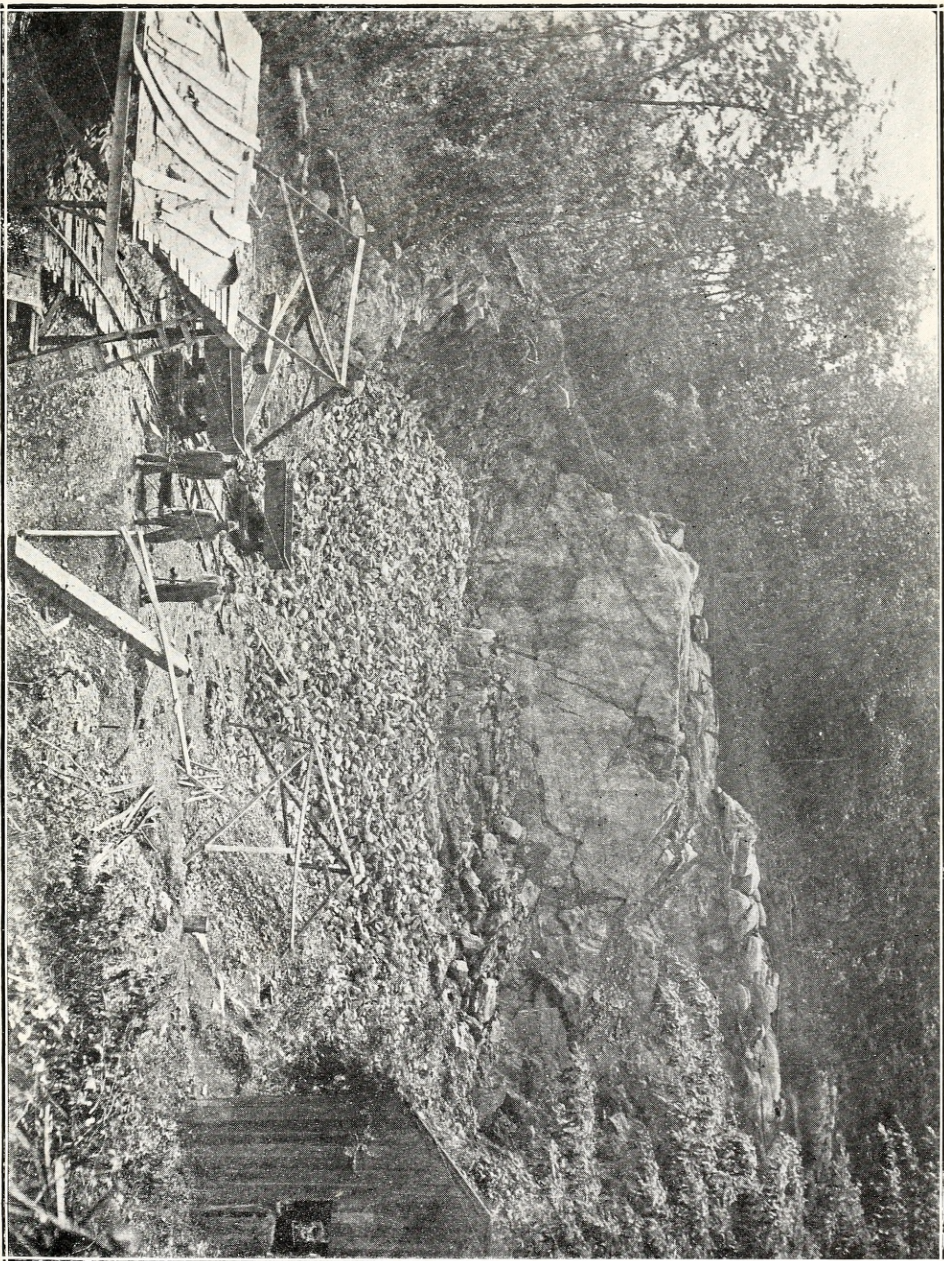
There can be little doubt that the propaganda set in motion by this department, for the use of limestone in agriculture, is not only becoming more popular, but is destined to accomplish more good than, perhaps, any other one thing it has undertaken in recent years.

The use of limestone has now reached the point where rigid policing is necessary, otherwise the farmers will certainly be imposed upon by low grade stone from quarries that contain much non-calcareous rock interbedded with layers of limestone and which will cost heavily to remove. The farmer is, thus, likely to get low grade limestone by reason of this non-calcareous rock being ground up with the limestone. Few quarries are free from low grade rock; and it is much easier and cheaper to pulverize this rock and sell it for limestone than to remove it as overburden. Our lime law should, therefore, be so revised as to enable the Commissioner of Agriculture to inspect and analyze limestone along with any other fertilizer materials. A tonnage tax, of say five cents a ton, should be collected and used to pay cost of inspection. Analysis, both physical and chemical, should be made of samples taken by legally appointed inspectors and the manufacturers required to settle with the farmers on the basis of the results of these analyses.

This very small tax would in no case be felt by the farmer or the manufacturer, as it would amount to only a dollar and a half for a car of 30 tons; and machinery can be constructed for putting such a law into effective operation.

Respectfully,

J. L. BURGESS, *In Charge Botany Division.*



NORTH CAROLINA STATE LIME PLANT, BRIDGEPORT, TENNESSEE
(Looking into quarry)

REPORT OF THE DIVISION OF HOME DEMONSTRATION WORK

To the COMMISSIONER OF AGRICULTURE.

SIR:—I herewith beg leave to submit the annual report of Home Demonstration Work from December 1, 1919, to December 1, 1920.

There were 59 counties organized in Home Demonstration Work in 1920, with an enrollment of 10,509 women, and 9,070 girls; total 19,579.

This membership attended meetings and carried out home-making programs in 461 clubs for women and 460 clubs for girls.

The largest enrollment was in Wayne County, which has 12 women's and 21 girl's clubs to her credit with a total enrollment of 942 members. Two hundred and thirty-one meetings were held during the year with an attendance of 9,000 people.

Wake County runs a close second, reporting 28 clubs for women and 8 for girls, with a total membership of 575. The total attendance through the year at club meetings was 10,304.

The program of work for club members in 1920 has been chiefly along clothing lines, especial stress being laid on dress design, millinery, and textiles. Foods, health, the installation of water and lights, home conveniences, interior decoration, beautification of home grounds, dairy and poultry work have all come in for a large share of attention, but the high price of dress and millinery made the problem of how to fashion one's own hats and garments a paramount one.

HOME MILLINERY

Systematic instruction with demonstrations was given in 42 counties, the club women and girls coming together to learn to refurbish old hats or to make new ones.

A very definite course was given in the making of simple hats. Bought frames were covered and the art of making frames was taught.

One home demonstration agent writes: "Not only did my club members make hats for themselves but they went home to instruct their neighbors. Hundreds of Wayne County women are wearing home-made hats."

Wilson County says: "A great many hats have been made at home and those bought are in a little better taste and perhaps are worn a trifle better for our instruction."

From the Johnston County agent's report the following is taken: "I think the most effective work done in my county this year was that in millinery. It was an inspiration to me to see how eager the women in the country were to learn how to make things for themselves. It

took very little advertising to get a crowd when a millinery demonstration was to be given. The most important phase of the work was in the selection of hats and the making over of old material."

In Mecklenburg, where an accurate account was kept, a report is sent in of 590 hats made by club women at an approximate saving of \$3,540.

"I wish I had known when I first began club work," says the Hertford agent, "that millinery would so thoroughly vitalize club work.

"I go out to meetings all over the county and no one wishes to leave the fascinating millinery lessons. I am frequently until dark returning home.

"I don't believe I exaggerate when I say that over 300 hats ranging in cost from ten cents to seven dollars were made at our club meetings."

Durham County reports over 200 hats made this summer.

DRESS DESIGN

A program of work in clothing, especially in dress design, has been put on in 49 counties. Instructions were given to women and girls in selecting dress materials, selecting and altering patterns, planning the dress, the importance of color and design, fitting and finishing. One thousand three hundred and nine demonstrations in clothing were given and results of these instructions have exceeded expectations.

As an experiment in Mecklenburg County a school of applied design or dressmaking was held at the club meeting place in three communities for five days each. Instruction began at 2:30 and lasted until 5 o'clock each afternoon. The attendance averaged 55 daily in each of the communities. There were so many requests from clubs in other parts of the county that plans for similar intensive work were made for each.

In Franklin County the club plan of work in sewing was with remodeled clothing entirely. The home demonstration agent says: "Two of our local women visited 18 communities with me. They wore remodeled dresses and hats and carried a suit case of remodeled garments to show as they talked to club members.

"To demonstrate the results of the lessons taught in remodeling both dresses and hats at our county fair the club women filled a sixteen foot square booth with remodeled dresses, coats, little boy's suits, and hats."

The sewing program for girls included aprons, club uniforms, dresses, and the making of curtains and decorative articles for their rooms. A notice of a meeting in Edgecombe County will serve to show the club girls interest. "The girls of Runnymede met on Monday for a lesson in the selection of materials. On Wednesday evening the instruction was in the cutting of a garment, basting, and doing the flat fell. The girls are quite apt and are seemingly interested in the seams they are sewing."

Many of the clubs are interested in testing and knowing textiles. The Wake County agent has done particularly good work in that line and

has, through her position as Chairman of Home Economics of the State Federation of Woman's Clubs, as well as county agent, been able to induce many women's clubs of the State to put on this good textile program:

- Our every day clothes.
- Testing linens, woolens, and silks.
- A study of economic household linens.

FOODS

The program in food, its selection, preparation and the nutritive value has been the best and most far-reaching work of the Division of Home Demonstration work since its organization.

Below are given the number and kind of important demonstrations given by agents to groups of women and girls in 1920:

Utilization of vegetables.....	405
Dairy products.....	377
Poultry products.....	313
Bread making.....	785
Child feeding, including school lunches.....	612
Invalid cookery.....	293
Steam pressure cookery.....	267
Fireless cookery.....	392
Canning	1596

The school lunch demonstrations were very effective. Forty-two schools report hot lunches inaugurated through the efforts of the Home Demonstration Club in the community.

The Wayne County agent reports: "I gave 12 demonstrations of proper school lunches in 1920, carrying with me a model container with a bottle and a well put together lunch.

"Many of our club women bought similar lunch boxes for Christmas presents for their children and were much interested in proper packing. We are coöperating with the County Rural School Supervisor to have one hot dish for lunch introduced in the schools."

BREAD CAMPAIGNS

The making of good bread has been greatly furthered by the nine county-wide bread and biseuit campaigns held in Buncombe, Franklin, Granville, Greene, Iredell, Perquimans, Sampson, Stanly, and Wayne.

The Sampson County agent says: "The campaign has certainly improved the quality of bread in Sampson County."

From Iredell comes: "I visited the different schools in the county giving demonstrations. Practically every teacher in the county was enrolled to help and 971 school children saw the demonstrations of bis-

cuit making which I, with my assistants, gave, and went home to make and bake biscuits at least five times before they could enter the county contest.

"There was first an elimination contest in each school, then one in each township and the best biscuits from each township were selected to contest for the county championship."

The Granville campaign was amongst the first and pointed the way just as Lincoln did in 1919.

Sampson and Stanley sent each a little girl prize winner to the State Fair to contest for a State prize by making and baking biscuits before a large crowd in the Home Demonstration Building.

CANNING

In 1920 the club women and girls filled a total of 1,670,426 containers with fruits, vegetables and meats at a value of \$637,201.

Of this amount 480,704 cans of fruit were put up by women and 104,047 by girls; 488,468 cans of vegetables by women and 198,205 by girls; women filled 252,610 jars with preserves, jellies and jams, and girls 132,596 glass jars with sweets. There were 13,796 cans filled with pork, beef, poultry, game, and fish.

There were 487 canning demonstrations given by club girls and 102 in drying.

The following equipment was made or purchased by club girls:

Kneeling pads and too aprons, 191; spraying outfits, 102; towels, 1,449; emblems, 201; jelly paddles, 168; driers, 40; sewing bags, 2,117; caps, 937; uniform dresses, 249; canning outfits, 226; others, 1,345; garden tools, 242; holders, 777; aprons, 2,639; packing paddles, 488; fly traps, 807.

Number of home demonstration centers established, 41.

Used as kitchens, 19.

Used as canneries, 28.

Used as drying plants, 8.

Number of women taking volunteer courses, 465.

DRYING AND BRINING—PREPARING MEATS

Women have been interested in drying, brining and particularly in smoking meat, making sausage, etc.

The following statistics are given:

No. of lbs. of dried vegetables.....	24,038
No. of lbs. of dried fruit.....	44,960
No. of gals. brined vegetables.....	63,779
No. of gals. of vinegar made.....	28,172
No. of gals. of fruit juices.....	9,403
No. of lbs. of smoked meat.....	1,751,034
No. of lbs. of sausage.....	301,863
No. of lbs. of lard.....	313,539
No. lbs. of other products.....	15,658

MUSCADINE GRAPE CULTURE

A group of club members in 21 of the eastern and central counties have been growing muscadine grapes and utilizing to advantage the products of the vineyard.

Beautiful grape juice, marmalade, and other muscadine products were exhibited at the county and community fairs demonstrating the value of this grape in the home and as a commercial product.

There were 338 demonstrations in the use of grapes given by agents. There were made by club members 5,425 pints of marmalade and other grape sweets, 1,212 quarts of grape sauce, 5,057 gallons of grape juice. Five hundred and seventy-six gallons of grape juice were sold.

HOUSEKEEPER'S WEEK

To spread the gospel of "Good tools for good work" 12 counties put on what was called Housekeeper's Week.

The Vance County agent says the coöperation of merchants carrying home conveniences was asked before perfecting plans for housekeeping week and a program of demonstrations was arranged to show just how these conveniences might be used. The papers gave much publicity to the county wide meeting at the county seat and club women came in from all over the county. Many town women attended also.

As a direct result of the demonstration merchants report sold to people in Vance County:

1 steam cooker, 15 oil stoves, 9 power washing machines, 2 cameras, 39 churns, 92 floor mops, 8 ironing boards, 6 electric irons, 15 refrigerators, 16 fly traps, 139 rolls of screen wire, 82 lawn mowers.

From Cumberland comes the report that the demonstrations of home conveniences at the township meetings during August followed by a four-day Housekeeper's Week at the county seat brought out large audiences of farm women and men also. We demonstrated the use of washing machines, steam pressure and fireless cookers, churns and many small conveniences.

The first Housekeeper's Week was held in New Hanover County and resulted in the sale of 15 lighting systems besides numerous oil and vapor stoves, electric irons, etc.

The Wilson agent reports that one company alone sold 180 lighting plants in that county, indirectly due to the campaign waged.

In Anson and Transylvania a truck was outfitted with all kinds of labor saving devices and carried around the county to club meetings where demonstrations were given.

HOME CONVENIENCES AND KITCHEN IMPROVEMENTS

The following statistics of home conveniences and of kitchen improvements have been sent in:

Kitchens rearranged, 414; kitchen floors improved, 585; kitchen cabinets bought or made, 144; fireless cookers bought or made, 421; steam pressure cookers bought, 73; bread mixers bought, 77; bread raisers bought, 80; food choppers bought, 303; other labor saving devices, 1,679; lighting systems installed, 548; water systems installed, 2,815; heating systems installed, 39; washing machines bought, 436; clothes hampers bought, 177; ironing boards made or bought, 448; wood boxes, 598; wheel trays, 112; others, 352; windows screened, 887.

INTERIOR DECORATION

Much interest has been manifested especially by girl's clubs in interior decoration, and instructions and demonstrations have been given in doing over old furniture, treating old floors and walls and in making draperies, rugs and covers of simple materials for the home. The art of dyeing has also been taught.

There has been reported:

Floors improved, 601; walls treated, 801; sleeping porches, 75; flower boxes, 921.

BEAUTIFICATION OF PREMISES

Reports from club members show that many have been improving and beautifying the premises.

The Guilford County agent writes: "A large nursery company has coöperated with me in trying to beautify the home grounds in the county by letting me have a lantern, slides, and a lecturer to help arouse interest.

Thirty-eight homes and ten schools were visited. The nursery company sent a landscape architect with me to make the individual visits and he suggested the use of native shrub trees and flowers and gave instruction for the planting.

That there might be demonstration centers established in the beautification of home grounds the Robeson, Durham, Person, Davidson, Franklin, and Stanly agents were furnished with blue prints of the proper laying out and planting of the grounds of certain individuals and schools in their counties. Four of them report work started.

The following improvements have been reported:

346 fences repaired, 8,092 winter gardens planted, 2,297 orchards planted, 1,045 trees planted, 605 shrubs planted, 284 lawns planted, 2,071 vines and other plants set out.

ENCAMPMENTS

There were held in the State 23 county encampments for girls and boys.

These club members came together for from three to five days at some suitable camping ground in the county where either tents were set up or some school or other building was used to house the girls and boys.

The home and farm agents were in charge of these encampments and with the aid of local women and men carried out systematic plans for feeding, housing, and regulating the daily programs of the children. Programs both of fun and instruction were carried out in each camp.

The Rowan County agent says of her camp, which was a typical one: "I consider the boys' and girls' camp the most effective and far-reaching piece of work done in the county this year.

"The first week in August I, together with the Cabarrus County agent, held a camp at the China Grove Farm Life School. Ninety-seven girls and boys attended.

"I believe the associations, along with recreation, demonstrations and instructions carried on at this time, put demonstration work on a solid foundation as it made every one of those girls and boys hail club work as their greatest opportunity.

"More than 50 mothers and fathers visited the camp and were enthusiastic in their praise. Many women have asked me to put on a short course for them next year in a program such as we carried out at the camp.

"The Farm Life School has been filled this year, whereas they had only about 50 per cent of their capacity last year."

The girls' part of the camp program, in addition to the games and the recreational features, consisted usually in lessons, in table service, preparation of foods, the making of a hat, basketry, and personal hygiene. In no encampment could all of these be given, but in all at least two of the subjects were stressed.

SHORT COURSES FOR CLUB MEMBERS

There were held last year in the counties 30 short courses for girls and 18 for women.

At Elon College, which was kindly tendered the Division of Home Demonstration Work, a short course for prize winning girls from the different counties in the State was held.

The Farm Women's Convention, enrolling 400 women, was a three-day short course in foods and household management.

That county agents might be able to refresh themselves in home economic subjects a six-weeks course was put on at the State College for Women, Greensboro, and such agents as could arrange to leave their work were urged to go. At the annual June school for agents, which was held at the same place, specialists from Columbia University and from the University of Illinois were brought out to give a two-weeks' intensive course in millinery and dress design. A course in household management was given by the home economics head of the college and journalism by the editor of the Extension Farm News.

One of the most important parts of this June school was the two-hour conference period each day when the county administrative plans and problems were discussed.

A very important piece of follow-up work in millinery instruction was that carried out through the coöperation of a big wholesale millinery house when it arranged for 25 agents to come to its work rooms and actually make hats under the supervision of its skillful milliner.

The following statistics show the number and kind of campaigns inaugurated by home demonstration clubs in 1920:

Household convenience, 1; bread, 9; fly eradication, 7; school lunch, 9; extermination of rats, 4; child feeding, 7; Red Cross, 5; anti-malaria, 1; others, 7.

In New Hanover the home demonstration agent coöperated with the county nurse in carrying out an anti-malaria campaign arranged by the North Carolina Landowners Association. The campaign was an educational one and extended over 22 eastern counties, in most of which home demonstration agents assisted. County officials day was held by this association in five eastern counties and on each program either the State agent in home demonstration work or one of the district agents spoke on "The Home." The heads of the departments of health, education, animal industry, and the Highway Commission all presented the work of their departments to large audiences.

FAIRS

There were held in the State in 1920 160 community fairs for white people and 28 for the negroes; 34 county fairs for white people and 9 for the negroes; 1 State fair for white people and 1 for the negroes.

Women trained in the county by home demonstration agents usually judge the community fairs, always judging in a community other than their own. At 91 fairs judges were supplied by the State office of home demonstration work, 33 county agents and 8 other trained women serving in this capacity. The community fairs are almost wholly the outgrowth of the home and farm demonstration work and are regarded by the agents as fine schools for the people. Expert judges are furnished by both the Division of Home and Farm Demonstration Work and as judging is done before the public and score cards explained results have been most satisfactory.

Forsyth presents the following program followed at community fairs:

Opening at 10 a. m. when all exhibits must be ready for judges.

Community singing.

Address by speaker.

Picnic dinner.

Better babies contest.

Discussions of exhibits with explanations of reasons for awarding premiums.

Athletic contests and field sports.

In Gaston County: "There were 14 mill community booths at the county fair contesting against each other."

The Mecklenburg agent writes: "One of the most satisfactory things we have done in the county this year was the organization of a County Community Fair Association. A committee from this association canvassed for advertisements and paid for the coöperative premium book of the seven community fairs. They had enough money left after paying for printing to give each fair \$90.

The association offered prizes of \$100, \$75, and \$50 for the best community fair.

At a community fair in Davidson County one club woman arranged a cottage cheese booth with seventeen attractive and palatable dishes prepared from cheese. Another gave a steam pressure cookery demonstration, arranging nearby in an attractive manner all of her meats canned by steam pressure.

The county fairs grew from the community fairs and, in addition to good exhibits of pantry-supplies, canning, garden products, clothing, including dresses and hats, there were given some of the same demonstrations described under State fairs.

STATE FAIR

At the State Fair in the building which was erected for home demonstration work important phases of work for women were demonstrated. Around the walls were ten booths, in each of which two home demonstration agents presided, demonstrating the following: Dress design, millinery, the testing of textiles, the selection and preparation of foods and kitchen conveniences, laundry work with improved machinery, beautification of the home grounds, beautification of the home, budgeting the income, and nutrition. The nutrition booth was in coöperation with the State Board of Health, and the Division of Farm Engineering put on in one booth a demonstration of how water may be installed in the farm house.

Down the middle of the building was an exhibit of fruits and vegetables in glass from forty counties.

The Division of Home Demonstration Work felt that the educational exhibits and demonstrations staged at the State Fair were a success if it might judge by the interest of the men, women and children.

COUNTY COUNCILS AND HOME BUREAUS

Each county agent has felt the necessity of having a council of county women as an advisory and supporting body behind the work.

Thirty-three counties have formed these organizations with a total membership of 1,108.

These councils meet with the county agent once a month. In Mecklenburg County the home demonstration clubs are federated with a membership of 150.

At the Farm Women's Convention in August at Raleigh delegates came from many of the county councils and they decided to federate their organizations into a State Home Bureau.

A campaign for membership in this organization will be begun in January.

North Carolina's Home Bureau is the first in the South and the second in the United States, New York preceding us.

POULTRY

Poultry club work was carried on in 25 counties by the home demonstration agents. In other counties the farm agents had it in charge. All instructions were sent out by Mr. A. G. Oliver, poultry club specialist.

Agents report in 25 counties an enrollment of 1,938 girls, including a few boys and 696 women, fulfilling minimum requirements of club membership.

No. members taking charge of entire flock.....	237
Average number fowls in flock.....	31
No. members purchasing standard bred stock.....	736
No. members purchasing pure bred eggs.....	971
No. members using standard bred males at head of flocks.....	829
No. members making brooders.....	325
No. poultry houses built.....	296
Approximate number chickens raised.....	141,381
Approximate number chickens fattened for market.....	58,318
No. lbs. market poultry sold.....	184,162
No. lbs. poultry eaten at home.....	221,790
No. fowls culled.....	711
No. members producing infertile eggs.....	135
No. roosters eliminated for production of infertile eggs.....	56
No. doz. eggs preserved in water glass.....	1,201
No. doz. eggs used at home.....	11,157
No. doz. eggs sold.....	5,897

Lee County reports 38 poultry entries at community fairs and Guilford reports demonstrations at 20 meetings showing how to prepare and serve poultry products.

The report of Sadie Covington of Anson County is interesting.

"On the first of January, 1920, I had 120 Rhode Island Reds. I sold from then to the first of May 92 birds for breeders.

These brought	\$557.00
Eggs for hatching, 42 sets.....	182.00
Eggs sold on market.....	30.00
Eggs used at home.....	30.00

Total	\$799.00
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I set 120 eggs and hatched 107—raised 100 chickens.	
Cost of feed until May 1,.....	\$ 55.00
Cost of advertising.....	10.00
Total cost	\$ 65.00

Kept on hand 25 hens.	
I value 10 at \$7.00 each.....	\$ 70.00
I value 15 at \$5.00 each.....	75.00
I value 3 cockerels, 2 valued at \$15 each, 1 valued at \$10.....	40.00
Total value of birds on hand.....	\$185.00

DAIRY

Reports come in from 34 counties of work done coöperatively with Division of Animal Industry by home demonstration agents.

The home demonstration agents in 27 counties received instruction in dairying by specialists from the Animal Industry Division. These instructions were given to groups of from three to five at different periods and places and enabled the home agent to put on a much better dairy program in her woman's clubs.

The following extract from the Guilford County report gives an idea of how work was carried on: "We held meetings with each woman's club when Mr. Kimrey, dairy specialist, talked on the value of milk and butter in the diet and the handling and marketing of milk and butter. He gave a demonstration of butter making.

"We have given demonstrations in cottage cheese making to club women also.

"A decided improvement in all dairy products was shown at our community fairs this fall. The butter was in brick molds and so uniform in color and quality that it was very hard to judge.

"The use of milk has been stressed in our club programs for the school lunch and the school lunches exhibited at the fairs all included a bottle of milk.

"Almost every club woman in the county has at least one cow."

The Lee County agent says: "According to a survey I made in Lee the average is two cows to a family."

STATISTICS

Approximate number of dairy cows in counties.....	35,958
Average price of milk per gallon.....	.66
No. cows purchased through your influence.....	178
No. demonstrators enrolled in butter making—girls 56, women.....	178
No. demonstrations given in butter making.....	744
No. of pounds reported made.....	93,205
Pounds sold.....	19,679
Average present price per pound of butter secured by demonstrators..	.62½
Average price secured for other home-made butter.....	.56
No. demonstrators enrolled in cottage cheese making—girls.....	100
women	444

No. demonstrations given in cheese making.....	96
No. pounds reported made.....	19,627
Sold	5,249
Average price per pound.....	.55
No. pounds cream sold.....	638
No. of demonstrations given in milk cookery.....	338
No. of families using more milk in family diet.....	1,251
No. of schools securing milk for the school lunch.....	61
No. of pupils in these schools.....	4,197

Equipment made or purchases: Brushes, 142; molds, 308; milking pails, 379; barrel churns, 181; name others, 15; butter workers, 95; sanitary strainers, 239; cheese presses, 25; shotgun cans, 65; paddles, 419; dairy thermometers, 99; iceless refrigerators, 113; separators, 134.

DISTRICT AGENTS' STATISTICS

Miles traveled.....	33,304
Meetings held.....	442
Attendance	37,873
Agents visited, (No times).....	277
Letters	4,144
Circular letters.....	2,157
Bulletins	3,069
Conferences	3,166
Number articles prepared for publication.....	170
Number encampments attended.....	13
Number counties in your district holding housekeeper's week.....	12
Number counties in your district having county councils.....	33
Number counties in your district organizing home bureaus.....	11
Number county fairs held in your district.....	35

STATE AGENT'S STATISTICS

Miles traveled.....	25,895
Talks given at meetings.....	31
Attendance	6,987
Conferences	528
Letters	2,832
Circular letters.....	694

Respectfully submitted,

JANE S. McKIMMON,

State Home Demonstration Agent.

REPORT OF STATE FOOD AND OIL CHEMIST

TO THE COMMISSIONER OF AGRICULTURE.

SIR: I beg to submit the following report of the work of the Division of Food and Oil Inspection for the years of 1919 and 1920:

The work is authorized by the following inspection laws: Food, bleached flour, bottling plant, linseed oil, illuminating oil, gasoline.

The object of the work is the enforcement of these laws and the object of the enforcement of these laws is to prevent the sale of food that is deleterious to health and the fraudulent sale of all products that come under these laws.

FOOD LAW

The law forbids the manufacture or sale of adulterated or misbranded food or beverage.

A food product is adulterated:

(1) If any substance has been mixed or packed with it so as to reduce or lower or injuriously affect its quality or strength.

(2) If any substance has been substituted, wholly or in part, for the article.

(3) If any valuable constituent of the article has been, wholly or in part, abstracted.

(4) If it be mixed, colored, powdered, coated or stained in a manner whereby damaged or inferiority is concealed.

(5) If it contains any added poisonous or deleterious ingredient which may render such article injurious to health.

(6) If it consists in whole or in part of a filthy, decomposed or putrid animal or vegetable substance unfit for food.

(7) If it differs in strength, quality or purity adopted by the Board of Agriculture.

A product is misbranded:

(1) If it be offered for sale under the name of another article.

(2) If it be labeled or branded so as to mislead the purchaser.

(3) If the label shall bear any statement, design or device which shall be false or misleading in any particular.

In food and beverages there are two classes of adulteration:

(1) Those which are deleterious to health.

(2) Those which tend to reduce or lower its quality or strength.

Manufacturers who desire to profit by the adulteration of foods employ, at great expense, the most able chemists and lawyers that can be had.

From the above it is evident that the subject of food adulteration and the enforcement of the law against the same is a much more difficult and far-reaching problem than is generally supposed.

It is gratifying to report that the first class of food adulteration has almost completely been driven from the market and the latter class has been reduced to a very small per cent, but that class of adulteration is far more remunerative to venders and much harder to prevent.

Inspections are made of all places where foodstuffs are made and sold and samples of same are collected by the inspector from every part of the State and shipped to the department for examination.

Many food analyses are very technical, long and difficult and require an expert chemist with extensive training and long experience for successful work.

During the two years about 2,500 samples of foodstuffs have been examined, a large number of which represented foods that originated in the State, such as milk, butter, ice cream and soft drinks. Much of such work as this is necessarily educational, but when intentional violations are detected the matter is reported to the courts. If there is sufficient cause to think that a violation was due to ignorance and carelessness the party is reprimanded and informed in regard to the matter.

It is gratifying to report that there has been a great improvement in the general condition of the sale of foodstuffs, but there is still cause for vigilant effort along this line.

BLEACHED FLOUR LAW

Flour is judged and graded largely on its color, the whitest flour naturally being the highest grade. When it is bleached white its color is not so indicative of its grade and being white does not necessarily mean that it is high grade.

The law requires that bleached flour must be labeled bleached.

The law is being generally complied with.

BOTTLING PLANT INSPECTION

This work is under a new law that has been in force a year and a half.

The first inspection under this law found many of the plants in the State in a most excellent condition—clean and sanitary. But while most of the plants were all right a few of them were not, in fact, some of that few were in a very dirty, insanitary condition and were a menace to health and unfair competition to the properly operated business. These plants were informed that their condition must be improved or they would have to be reported to the courts. Later inspections found some of them in much better shape, while three plants did not take heed and were again found in very dirty condition and they will have to answer in the courts.

LINSEED OIL INSPECTION

The linseed oil inspection law requires that all linseed oil or oils used as substitutes for linseed oil must be labeled what they are so that the purchaser can see what he is getting and provides for a penalty for adulteration or misbranding.

For lack of chemically trained help this work has not received the attention that should have been given it, but about 150 samples have been examined, some of which were adulterated and misbranded, but as the dealers were not well informed in regard to the law no prosecutions have yet been made. We now have a better force for this work and further violations will be sent to the courts.

ILLUMINATING OIL AND GASOLINE INSPECTION

The inspection of illuminating oil and gasoline is conducted together by the same inspectors. The inspectors meet shipments of oil and gasoline arriving in the State to see that the inspection tax is paid and to secure samples of oil and gasoline. The samples are forwarded to the department for examination by the State Oil Chemist. If the examination shows that the sample does not meet the requirements of the law, the product is refused sale in the State and is required to be shipped out.

Most of the oil shipped into the State now meets the requirements, both as to burning quality and safety, though, due to careless handling by employes, oil now and then becomes accidentally mixed with gasoline which renders its use dangerous. There is practically no intentional violations of the oil law.

During the two years 5,875 samples have been examined and in all cases where the oil appeared to be dangerous it was traceable to accidental contamination with gasoline.

The volume of gasoline coming into the State and being consumed is becoming tremendous. It is more than double what it was two years ago. The great demand for gasoline makes the business an attractive field for fraud and that, together with the fact that many new refineries are entering the business, makes it very necessary to keep a vigilant watch over the business to prevent the sale by some refineries of very low grade products.

It is gratifying to report that during the past two years most excellent work has been done under the gasoline law and 12,856 samples were collected and examined. Now and then shipments are found that do not meet the requirements and the sale of same is forbidden and the gasoline is shipped to some State where there is no gasoline law or back to the refinery.

Since several other sister states have adopted gasoline laws and the Government has adopted standards or specifications for gasoline to be used by the army and navy, it is an easier matter to enforce a gasoline law. When only this State and South Carolina had gasoline laws if a

high standard was required by them the refineries were inclined to resent it and sell their product elsewhere. So, much diplomacy and caution was necessary in handling the matter.

The grade of gasoline sold in the State now is good and is the same quality that is demanded by the Government for use by the army and navy. The law is working well.

SPECIFICATIONS

The following standards or specifications are in effect at present and are being enforced.

1. Boiling point not higher than..... 60°C. (140°F.)
2. Twenty per cent must distill below..... 105°C. (221°F.)
3. 50 per cent must distill below..... 140°C. (284°F.)
4. 90 per cent must distill below..... 190°C. (374°F.)
5. The end or dry point not higher than..... 225°C. (437°F.)
6. Not less than 95 per cent of distillate can be recovered.

Respectfully submitted,

W. M. ALLEN,

State Food and Oil Chemist.

REPORT OF DIRECTOR OF WAREHOUSES

TO THE COMMISSIONER OF AGRICULTURE.

SIR: In submitting to you my report as Field Organizer and Director of Warehouses, I desire to say that on account of considerable influenza being in the country last winter, I held but few Farmers' Institutes at that time, and by special request held others during the spring and summer. Therefore, in accordance with the wishes of the board, I early gave my attention to the cotton warehouse proposition.

I visited most of the cotton growing counties from Currituck to Mecklenburg counties. At every place I went I found some interest in warehouses, but the high prices of labor and materials of every kind, coupled with the almost impossibility of securing building material, dampened the ardor of many of those interested in cotton warehouses.

The high prices at which cotton was then selling satisfied a great many farmers who seemed to think prices would continue at the then high level, therefore, they did not feel the necessity of warehouses and were not especially interested in them. However, a change came when cotton began to drop in price and the cry came from every cotton growing section asking us to go over and explain the warehouse proposition to them. As a result, in several localities they promised to build cotton storage houses and in others they deemed it advisable to convert tobacco warehouses and other available buildings into cotton warehouses.

Temporary arrangements were decided on at Kenly, Creedmore, Swan Station, Oriental, Chadbourn, Tabor, Fair Bluff, Raeford, Fairmont, Jacksonville, Bellgrade, Gates, Clarkton, and possibly other places. New warehouses have been proposed for Spring Hope, Whitakers, Pittsboro, Moncure, Whiteville, Greenville, Candor, Troy, McFarland and Sanford. New warehouses have been built at Clinton, Monroe, and at Smithfield. The farmers of Cumberland County after making a survey decided to purchase a warehouse in Fayetteville instead of building. There was considerable interest manifested in cotton warehouses at Elizabeth City, Hertford, Freemont, Goldsboro, Mt. Olive, Raleigh and possibly other places. Some of these may not materialize, but others of them are now or soon will be in operation. I am sure the leaven will continue to work and the number of active cotton storage warehouses in the State will be very materially increased.

In accordance with the resolution adopted by the board at the December meeting, the chief of the division of markets was to act as superintendent of warehouses. Mr. B. F. Brown was elected chief of the division of markets and reported for duty in October. At the suggestion of Dr. Poe, I had a conference with Mr. Brown as to a proper division

of our work, Dr. Poe stating that he was sure the members of the board would agree to any arrangement that Mr. Brown and I might agree to. At that conference Mr. Brown and I agreed that I should have charge of the field organization for the purposes of building warehouses and the converting of other buildings into temporary warehouses, he to take charge of the warehouses when ready for occupancy, the management and the disposition of the cotton or other contents. When not otherwise engaged, I can assist in warehouse inspection, checking up books, etc. We agreed to this because we thought it was in the interest of the work and offered a harmonious plan of coöperation. If, however, the members of the board have a better plan, I shall be glad for them to make it known. I welcome any suggestion that will improve the work. It is my desire to give to our people the best service at my command, having uppermost in my mind the best interest of our cotton farmers and others who desire to warehouse their crops.

Referring to the law creating a fund from a 25 cent bale tax to protect the State warehouse system against loss, one-half of which shall be available for loans to build warehouses, I beg to suggest that I think the law should be changed so as to make the entire amount of the fund available for warehouse building purposes. In doing this the securities to the State would not be lessened or weakened, and the cotton farmers of the State would be better served. There are doubtless other changes that should be made. This matter, however, will be in the hands of your legislative committee and they will do whatever they deem best in the matter.

Again, referring to Farmers' Institutes, I am herewith enclosing a copy of a letter from Dr. J. M. Stedman, Farmers' Institute specialist, relative to the discontinuance of Farmers' Institutes in this State. It was gratifying to know from Dr. Stedman the esteem in which he held our North Carolina Farmers' Institutes. I hope you will read his letter.

North Carolina, as we all know, has rapidly gone forward agriculturally within the last few years until last year it stood fourth among the states in her crop values, a fact which we are all proud of. This forward march was the result of the activities of the several agencies coöperating in developing the many possibilities of our State along agricultural lines. It is gratifying to those of us who were engaged in Farmers' Institute work to know that we had a part in this splendid work.

Since institutes were discontinued a year ago a great change has come over the agricultural conditions of the country. A change that will require a readjustment of many of our farm practices. Changes that will tend to safe and sane farming on a sound basis devoid of speculative risks.

It is because of this that I am recommending reinstating Farmers' Institutes, especially applicable to counties where there are no farm demonstration agents, and also to counties where the agents desire them.

Under existing conditions it seems to me that every effort should be made to readjust our agriculture to fit the conditions now confronting us to keep North Carolina in the lead and retain the position we now occupy.

For director of institutes I suggest you get a man with a vision of their possibilities, and who understands North Carolina's agricultural conditions and needs; one who can give his entire time to the work. I also recommend that you give him good assistance that he may make the institutes worth while.

This recommendation is in accord with our State laws governing the Board of Agriculture and its duties, as set forth in Chapter 479, Section 4 (12) Public Laws of 1901. The recommendation is also made because of the many expressions of regret concerning their discontinuance that I have heard.

The recommendation is made solely in the interest of the farmers of the State and their families. Reinstating the institutes would show to them that you were doing everything you could to assist them in meeting the very perplexing situation now confronting them. I feel sure that whoever has charge of the institutes will do whatever he can to put before the people the need of a better system of agriculture than we are now practicing.

In addition to the above, the institutes would afford splendid opportunities to present the claims of warehouses in the cotton-growing counties.

Respectfully submitted,

T. B. PARKER,
Field Organizer and Director of Warehouses.

REPORT OF COÖPERATIVE CROP REPORTING SERVICE

To the COMMISSIONER OF AGRICULTURE.

SIR:—The attached annual report covers the combined operations and expenditures of the Division of Agricultural Statistics and of the Coöperative Crop Reporting Service.

Happily for North Carolina, the initiative and lead taken in statistical work has earned the envy of non-cooperating states. The results have meant a handsome investment, and the yearly profits will continue for the initial and succeeding investments. The compliments sent from Secretary Meredith and Chief Estabrook are evidences of the appreciation felt at Washington. In fact, commendation has come from all sections and interests.

The total expenditure 1920, by N. C. Statistics Div.....	\$ 9,140
The unexpended balance is.....	860
Bills unpaid—rendered 18th (Nov. expenses and paper).....	367
	<hr/>
	10,367
The U. S. cooperative expenditures for same period.....	\$11,602

The State gets the full benefit of both appropriations. Full approval of and demands for its enlargement conspicuous. The cost to the State of this budget is equal to a mere one cent stamp for each *male* person on North Carolina farms. Much of the work performed is State and not Cooperative features.

The Regulatory and Cooperative work should be considered separately, as the U. S. funds apply only to Crop Estimates work and not to state requirements.

RECOMMENDATIONS

It is respectfully recommended that the work of this division be continued as at present conducted. The unexpended field funds have permitted recently of the start of most of the work recommended a year ago.

More *field travel* and investigations are essential for comprehensive and appropriate sectional information, interpretations, and cooperation.

Encouragement of the present personnel by paying reasonably for work done.

The development of *County Reporting Bureaus* through the Extension Agents and others, so as to permit of local interpretations and the earliest usages of information.

The inclusion of *publications* from this division under the regular publications appropriation.

The issuance of *monthly and annual summary bulletins*, including "1920 Farm Crop Statistics of North Carolina," "1920 Livestock Statistics for North Carolina," "North Carolina Legume Crops for 1920," "North Carolina Threshed Grains."

It is further recommended that the unpaid November expense account and bills rendered by the Bureau of Labor and Printing, amounting to \$367, be paid from the unexpended funds of this division.

All of these features are contemplated as they are necessary for a continuance of the *results* frequently requested and needed. The unexpended funds this year were not due to a lack of need, but to the inability to get needed field work started earlier and to that preventing field travel. Results were lost if money saved.

WHAT HAS BEEN DONE IN 1920

REGULAR REPORTS ISSUED:—56,200 copies.

19 issues of monthly releases.

SPECIAL REPORTS ISSUED:—18,600 copies.

32 issues. (Cotton, Tobacco, Peanuts, etc.)

STATE RECORD SHEETS BY COUNTIES:—158 sheets. Each sheet provides for 7,450 items.

SPECIAL FEATURES:—

Annual acreage chart—5,000 copies.

Annual statistical bulletin—5,000 copies—52 pages.

Bulletin on value of agricultural statistics—6,000 copies.

Original calculating table—a time and worry saver—500 made. Fair exhibit.

State Fair tickets offered free to 350 best reporters.

Specially compiled reports furnished as requested.

Plans made for getting results (information) back to farmers.

ENVELOPES USED:—219,000 by local office alone.

PAPER USED:—216,000 sheets. 54,000 schedules.

MONTHLY BULLETINS:—Year's totals:

Reports on all crops—"Farm Forecaster".....	44,000	Copies
Cotton Reports to press and specials.....	4,800	"
Tobacco Sales Reports (separate).....	8,100	"
Farm Prices Reports (begin September, 1920).....	3,500	"
Two Special Reports, monthly.....	8,400	"
Press releases (for all reports).....	21,000	"

OFFICE ROUTINE:

Four times the correspondence of 1919.

Heavy filing by subject and cross referencing—18 file cases.

Card indexes—7 drawers card lists.

Maintaining heavy list of reporters—(now)..... 3,360

Addressograph lists—all..... 7,765

COMPLIMENTARY:—

Many thousands of bulletins and publications sent to co-operators and to others upon request.

SCOPE:—

The work covered embraces the entire farm.

(A very exacting and continuous work.)

- (1) *Crops*.—Acreages, conditions, yields, quality, production, prices, stocks on hand, etc. Per cent marketed, shipped, damages, abandonments, percentages of crops, when planted, when harvested, etc.

- (2) *Livestock*.—Numbers, per cent each breed, mortality, condition, values, breeding stock, comparisons, etc.

- (3) *Various*.—Land values, wages, farm wood used, idle lands, progress farm work, plowing, harvesting. Fertilizers used, amounts, costs, analyses.
- (4) *The Office Routine* embraces: Correspondence, over 200 subject files (ONE of these covers 100 county survey folders and ANOTHER the alphabetical correspondence), cross reference card indexes, card indexes of different class of reporters, making addressograph plates, maintaining lists, addressing envelopes, preparing inquiry blanks, sending these out, receiving and tabulating reports, checking reporters, getting new ideas, sending bulletins, periodicals and reports, rendering average of eleven exhaustive reports monthly. Mimeographing and multigraphing letters, inquiries, reports, etc., interpreting statistics into reliable matter, developing tobacco sales reports (one of heaviest tasks—10 days one person's time). Making classified permanent records.

RESULTS:—

Recognized as one of the leading states providing agricultural data. Annual bulletins interesting many prospective settlers from other states. The 1920 investment has yielded visibly wonderful results. Distinctly favorable attitude by the press, farmers and business interests. One farmer *alone* said that it had led him to save thousands of dollars. Many said the information had led them to plant and sell to advantage. Results are beyond expectations.

FEATURES OF AGRICULTURAL STATISTICAL WORK

REPORTS

Special and regular reports are released monthly covering the different phases of all important crops, livestock, etc. The features are acreage, condition, yield, production, quality, stocks remaining on farms from previous year and monthly prices. Reports are either printed, multigraphed or mimeographed. The preparation and dissemination of these reports require a considerable effort and accuracy.

CORRESPONDENCE

The correspondence of this division has increased immensely during the past year. Frequent requests on short notice call for special reports. This often means that special interpretations must be made. This work requires accuracy, neatness and a constant pressure. Qualifications for this position are not found in the average stenographer, who is not willing to be rushed and accept complicated filing responsibilities. Great difficulty has been experienced in maintaining the extensive file work. An experienced and responsible person must have charge.

FIELD WORK

Field travel is necessary so as to intelligently edit and verify reports, such as a farmer must visit his fields in order to get the viewpoints of his laborers and plan for his work. It is necessary to travel into all parts of the State during the different periods of the year so as to get the essential knowledge of field conditions, make checks on estimates, determine the viewpoints of reporters and of the average farmer. A field assistant has proven essential

to the continued service, and in order to facilitate better cooperation with other field agencies. This man should spend at least half his time in studying county and field conditions. One-fourth time travel is also necessary for the Agricultural Statistician and Assistant. Men capable of this work must necessarily have unusual qualifications for analyzing conditions and interesting men. Field travel affords the best means for getting good reporting lists and of winning favor toward organizations, county agents and the press.

LISTS

Our regular reporters number over three thousand and the special aids more than six thousand. Not a cent of compensation is paid for their aid. It is necessary to send out approximately ten letters for each new regular aid secured. The average life of these is a few months but it has increased with the better attention given them this year. More than 300 have been serving over three years. Constant vigilance and tact is necessary to check and hold an adequate list of reporters. Qualification blanks and records are essential as a means of classifying and securing aid where weaknesses occur.

RECORDS MAINTAINED

Records are the final results or evidence of the work. They must be in a form for constant reference duty. Their making requires speed, accuracy and constant strain, due to the tedious nature of the work. A most dependable and accurate clerk and good penmanship is necessary.

CLERICAL

Experience has shown that the average clerk cannot be used in statistical work, for where an error is made, it takes two to catch it. The constant change of clerks means loss of time, experience and money. Better loyalty and interest is not found anywhere than with our personnel. But experts cannot be held at salaries of apprentices. Too many others want them and a change costs too much.

PUBLICATIONS

The real results are best achieved through the use that is made of statistical information. This is best accomplished through a printed monthly publication like the "Farm Forecaster" and the annual bulletins covering special subjects. There being many features not permitted to pass free of postage that should reach the public, and as the cost aggregates less through second class postage than under the frank, it is recommended that the "Farm Forecaster" hereafter be issued as second class mail matter and charged to the publication account. In this way any department news can be issued to the public as well as much valuable information not now published. The postage would amount to less than four dollars per month.

Respectfully submitted,

FRANK PARKER, *Agricultural Statistician.*

REPORT OF DOG TAX TAGS

To the COMMISSIONER OF AGRICULTURE.

SIR:—Below is a statement of the sales of dog tax tags through the State Department of Agriculture during the years 1919 and 1920.

1919			1919		
<i>County</i>	<i>No. Tags</i>	<i>Price</i>	<i>County</i>	<i>No. Tags</i>	<i>Price</i>
Alamance	2,000	\$ 60.00	Hyde	1,500	45.00
Alexander	1,300	39.00	Iredell	3,000	90.00
Anson	2,500	75.00	Jackson	1,500	45.00
Ashe	1,600	48.00	Johnston	3,000	90.00
Beaufort	1,500	45.00	Jones	1,100	33.00
Bertie	3,750	112.50	Lee	1,000	30.00
Bladen	4,000	120.00	Lincoln	1,600	48.00
Brunswick	500	15.00	Macon	1,517	45.50
Buncombe	1,500	45.00	Madison	2,500	75.00
Burke	1,200	36.00	McDowell	1,000	30.00
Cabarrus	2,500	75.00	Mitchell	500	15.00
Caldwell	1,500	45.00	Montgomery	1,230	36.90
Catawba	2,000	60.00	Moore	1,500	45.00
Chatham	2,500	75.00	Nash	3,500	105.00
Chowan	800	24.00	New Hanover	1,500	45.00
Clay	1,000	30.00	Onslow	2,000	60.00
Cleveland	2,000	60.00	Orange	2,000	60.00
Columbus	3,000	90.00	Pasquotank	1,500	45.00
Craven	1,500	45.00	Person	1,800	54.00
Dare	100	3.00	Polk	1,000	30.00
Davie	1,500	45.00	Rutherford	1,500	45.00
Dupl'a	1,000	30.00	Stanly	1,800	55.50
Durham	1,500	45.00	Stokes	1,900	57.00
Edgecombe	4,500	90.00	Tyrrell	600	18.00
Forsythe	1,000	30.00	Washington	1,000	30.00
Franklin	2,000	60.00	Watauga	1,000	30.00
Gaston	2,000	60.00	Wilkes	2,000	60.00
Graham	500	15.00	Wilson	5,000	150.00
Granville	2,000	60.00	Yadkin	1,500	45.00
Greene	2,000	60.00	Yancey	1,000	30.00
Harnett	3,000	90.00	Robeson	4,000	120.00
Haywood	2,000	60.00			
Henderson	1,000	30.00	Total 65 Counties..	118,547	\$3,511.40
Hertford	2,200	66.00			

1920			1920		
<i>County</i>	<i>No. Tags</i>	<i>Price</i>	<i>County</i>	<i>No. Tags</i>	<i>Price</i>
Alamance	3,000	\$ 90.00	Iredell	2,500	125.00
Anson	2,500	125.00	Jackson	1,000	50.00
Ashe	1,600	80.00	Johnston	3,000	150.00
Avery	50	1.50	Lee	1,000	30.00
Bertie	3,750	112.00	Lincoln	1,400	42.00
Buncombe	1,500	45.00	Macon	1,300	39.00
Burke	600	18.00	McDowell	1,000	25.00
Cabarrus	2,200	110.00	Nash	1,000	30.00
Caswell	1,800	54.00	New Hanover	1,000	30.00
Catawba	2,500	75.00	Pasquotank	1,000	30.00
Chatham	2,500	125.00	Perquimans	1,000	30.00
Chowan	700	21.00	Person	1,700	51.00
Columbus	3,000	80.00	Rutherford	1,500	45.00
Craven	1,500	45.00	Sampson	2,000	60.00
Davie	1,600	80.00	Stanly	2,000	60.00
Durham	1,650	45.50	Stokes	1,600	80.00
Edgecombe	4,500	225.00	Swain	1,500	45.00
Franklin	3,000	90.00	Tyrrell	600	30.00
Gaston	2,000	60.00	Watauga	800	24.00
Graham	300	15.00	Wilkes	2,000	60.00
Green	2,000	60.00	Wilson	4,000	200.00
Guilford	3,500	105.00	Robeson	3,000	90.00
Haywood	2,000	60.00	Rockingham	3,000	90.00
Henderson	1,000	30.00	Dare	100	3.00
Hertford	1,000	30.00			
Hoke	700	21.00	Total 50 Counties..	90,950	\$3,267.00
Hyde	1,500	45.00			

Respectfully submitted,
 WILLIAM H. RHODES, JR., *Assistant Statistician.*

REPORT OF THE DIVISION OF MARKETS AND RURAL ORGANIZATION

To the COMMISSIONER OF AGRICULTURE.

SIR: This report is for the year ending December 1, 1920, and covers the investigation, extension and service work of the Division of Markets and Rural Organization, conducted jointly or separately by the North Carolina Department of Agriculture and the North Carolina State College of Agriculture and Engineering, in coöperation with the United States Department of Agriculture under the agreements and plans entered into by these institutions for the conduct of all agricultural work of this kind in the State.

COTTON WAREHOUSE SYSTEM

The North Carolina Cotton Warehouse System is in full operation. The first lease and application for license was received September 25, from the Sampson Cotton Storage Warehouse at Clinton, N. C. Eighteen applications in all have been received, as follows:

<i>Location</i>	<i>Capacity</i>	<i>Location</i>	<i>Capacity</i>
Clinton	2,000	Morven	1,500
Creedmoor	300	Lumberton	3,000
Fayetteville	3,000	Fairmont	1,000
Swann Station	450	Lilesville	600
Lillington	1,000	Chadbourn	600
Kelford	500	Polkton	600
Moncure	600	Waxhaw	300
Monroe	5,000	Sanford	2,000
Selman	600	Wadesboro	350

Totals: 18 warehouses.....23,400

Of these eighteen, twelve have been licensed and are in operation as follows: Clinton, Creedmoor, Fayetteville, Kelford, Moncure, Monroe, Selma, Lumberton, Fairmont, Lilesville, Polkton, and Waxhaw. The rest of those on the list from whom applications have been received will be licensed soon, while applications are being received nearly every day. It seems probable that we will have at least twenty-five houses this season, and possibly many more.

The total cotton received for storage to date, November 22, is 3,521 bales.

PROMOTION AND ORGANIZATION OF WAREHOUSES

Some work in promotion and organization has been done by every one connected with our cotton work. Mr. T. B. Parker, as field organizer,

has visited most of the cotton growing counties of the State during the year, finding during the early part of the year that the relatively high price of cotton and of building materials was dampening the ardor of many of those interested in cotton warehouses. However, considerable interest was shown at Kenly, Creedmoor, Swann Station, Oriental, Chadbourn, Tabor, Fair Bluff, Raeford, Fairmont, Jacksonville, Belgrade, Gates, and Clarkton. New warehouses were being considered at Springhope, Whitakers, Pittsboro, Moncure, Whiteville, Greenville, Candor, Troy, McFarland, and Sanford, while new houses have been built at Clinton, Monroe, and Smithfield. Considerable interest was shown at Elizabeth City, Hertford, Fremont, Goldsboro, Mount Olive, and Raleigh.

Assistance in the organization of warehouse companies and the extension of general engineering service has been supplied by Mr. J. M. Workman, jointly employed by this department and the United States Department of Agriculture and located in Raleigh.

The work has consisted in correspondence with those interested in securing warehouse service and in visiting these locations as fast as local interest developed. Suggestions have been given for organizing companies, suggested forms of by-laws and constitutions have been supplied, meetings addressed, and finally complete working plans have been furnished in coöperation with local architects and questions of insurance have been handled with insurance rating boards.

Visits have been made to the following places for the purpose of holding conferences, addressing meetings and advising in regard to construction:

Hertford	Charlotte	Lilesville
Wilson	Smithfield	Polkton
Fayetteville	Jackson	Seaboard
Rocky Mount	Moncure	Rich Square
Rowland	Farmville	Selma
Elizabeth City	Wadesboro	Clinton
Greenville	Parkton	Monroe
	Raleigh	

Of these places plans or layouts have been prepared for warehouses at Hertford, Raleigh, Rowland, Greenville, Smithfield, Farmville, Wadesboro, Clinton and Monroe. Companies at the other places which have been unsuccessful in raising sufficient funds, have decided to defer building operations, or are still making efforts to raise the necessary stock subscriptions. A few small warehouses have been erected at other places, as for example, Moncure and Polkton.

Preliminary assistance through correspondence has been given to individuals at the following places: Candor, Gliden, Shelby, Maxton, Aulander, Kelford, Hamlet, Sanford, Kings Mountain.

INSPECTION AND OPERATION OF WAREHOUSES

The inspection of warehouses and the general supervision of their operation has been under the general direction of Mr. James P. Brown. He has inspected all the houses that have applied for admission to the State system and sent in reports and applications for admission into the Federal system under the United States Warehouse Act, besides rendering valuable service in getting the State system under way.

CLASSING AND GRADING

The classing and grading under the supervision of Mr. P. H. Hart, while not strictly a part of the warehouse system, is closely connected with it. All the cotton going into storage in the State warehouses has been classed and graded by our State graders, except that at Fayetteville, Lumberton, and Fairmont. At these places special graders have been appointed.

Cotton grading and marketing offices were established at the following places for the cotton season of 1919 and 1920: Tarboro, Lumberton, Clinton, Fayetteville, and Raleigh, for the purpose of serving the people of Edgecombe, Robeson, Sampson, Duplin, and Cumberland counties. The Raleigh office served no particular county, but offered its services to all cotton growing counties, except the above named.

The Raleigh office also offered its services to the cotton mills of the State. The work during this season was conducted along the same lines as heretofore.

Arrangements were made with all the ginner in the counties named to send samples of each bale ginned by them; provided it was agreeable to the owner of the bale, to the grading office situated in their respective counties. These samples were identified by numbers corresponding to those upon the bales. Supplies for forwarding the samples were furnished to the ginner free. These consisted of tags, with coupons attached, for each bale of cotton, paper wrappers for each sample, and containers for mailing samples, with franked mailing tag for each container. The ginner is paid two and one half cents for each sample sent in. The owner's name and address is placed on coupon inside sample. Upon receipt of the sample at the grading office, it is immediately graded, and grade certificate showing grade and staple is mailed the owner.

In order for a county to obtain the services of a grader, the county commissioner appropriated the sum of \$250.00 for this season. This money was used in defraying local office expenses and paying ginner of that county for sending in samples.

The Edgecombe County office graded 6,442 bales; Sampson and Duplin counties office, both counties being served from one office located at Clinton, 6,334 bales; Robeson County, 3,935; Cumberland County, 1,743; Raleigh office for producers, 1,339, and for the cotton mills,

3,306. Total amount all offices, 23,399. This does not include the total amount graded for the full cotton season, only giving the amount graded since December 1st, 1919.

The following offices were established for the cotton season of 1920 and 1921: New Bern, Clinton, Tarboro, Smithfield, Wadesboro, Monroe, and Raleigh. The work is to be conducted as it has in the past. This report covers only three months of this cotton season, September, October, and November. The New Bern office has graded 1,248 bales, Tarboro office 5,258 bales, Monroe office 3,744 bales, Smithfield office 4,625 bales, Wadesboro 5,359 bales, Clinton office 2,598 bales, Raleigh office, producers, 1,210 bales, cotton mills, 1,090; total 2,300 bales.

The Clinton, Monroe, and New Bern offices were late in getting established, which accounts for the small amount graded at these offices so far.

The total amount graded at all offices during the year December 1, 1919, to December 1, 1920, is 57,531 bales.

LIVESTOCK

Eggs and Poultry.—Investigations and observations made at previous times show there is a decided need for a more remunerative plan of marketing eggs and poultry. This is more especially true in the Piedmont and western sections of the State that are more distant from some of the larger cities. In the eastern section of the State large quantities of both eggs and poultry are shipped to the Norfolk market by farmers themselves. Consequently, they have a fairly good market. However, if they would produce a higher quality product, they could well afford to ship further north, where their produce, especially the eggs, would command a higher price.

In the Piedmont and mountain sections practically all of the poultry and eggs are sold locally either at stores, to dealers, or to produce wagons in some localities. As is to be expected when sold in this way farmers do not get what they should for their products. It is known that some of the produce dealers in that section are making very handsome profits. There is a decided need for poultry and egg marketing circles in that section.

Cattle.—During the fall of 1919 a fairly complete list of the feeder and stocker cattle for sale in the western part of the State was prepared and distributed among cattle feeders, butchers, county agents, and other interested parties, for the purpose of assisting in the movement of these cattle. A considerable number of cars were placed in this way. However, because of roughness of the country, it is almost impractical for cattle feeders from eastern counties to go to the cattle growers in the mountain sections for their cattle and consequently in the past most of them have been buying through dealers.

In an attempt to remedy this situation, a cattleman's association, composed of the growers of feeder and stocker cattle in Avery, Mitchell,

and Yancey counties, was formed early this season and plans were made for holding a coöperative sale of feeder and stocker cattle at Spruce Pine on September 23rd. At this sale cattle from three counties were assembled and sold at private sale. About 700 cattle were included in this sale.

Some interest is being manifested in the coöperative shipment of cattle and some of this is being done, but only in a limited way. It is quite probable that there will be a gradual increase in the number of cattle sold in this way when they are in market condition. It now seems, however, that the sales plan above outlined is the most practical plan of selling feeder and stocker cattle, as no regular feeder and stocker cattle market is available.

Considerable personal assistance was given in the sale of fat cattle during the spring of 1920. As a rule this class of cattle has been going largely to northern markets, but this year a surprisingly large per cent of them have been bought by butchers in the State. This is a very good indication that there is a growing demand for the better grades of beef. In many instances the prices obtained for these fed steers have been from $\frac{1}{2}$ to $1\frac{1}{2}$ cents per pound above northern markets, freight and "drift" considered. However, in spite of these prices, most cattle feeders lost money on feeding this year.

Hogs.—Coöperative hog shipping work was instituted in a number of counties, making a total of 11 counties in which this work is being carried on. There is really no surplus of hogs in the State, although local markets will frequently force local prices down during the height of the hog marketing season, unless arrangements are made among farmers to market their hogs coöperatively. A number of definite examples have been seen of the value of coöperative marketing in stimulating local markets. In other instances local prices have advanced from 1 to 2 cents per pound where coöperative marketing has been submitted to farmers of a county, even though no shipments were actually made.

Another value of coöperative shipping is that it causes farmers to see that local markets do not have to be depended upon and in this way stimulates production.

Fortunately for farmers in the eastern counties of the State, most of their local markets and some of their larger markets to which they shipped dressed hogs by express, do not discriminate against soft hogs, so in that way they frequently get more for them than if shipped to the Richmond and Baltimore markets. About 95 per cent of the hogs raised in the eastern part of the State are soft, being fattened on either soy beans or peanuts. Practically all local markets west of Raleigh discriminate against soft hogs. In fact, it is almost impossible to sell them in that section of the State. Markets in that section of the State also discriminate very strongly against the Duroc Jersey hog, claiming it produces too much lard which they cannot use profitably. Not infre-

quently they will pay from 1 to 3 cents per pound more for Berkshire or Poland China hogs. In some instances this discrimination is justified on the fresh meat market, as there are a large number of short chunky Duroc hogs in the locality referred to. However, the more growthy type is rapidly growing in favor among farmers.

Coöperative hog shipments are carried on largely through county agents as there is hardly enough surplus hogs in a county to justify a shipping association. County agents have taken considerable interest in this work, and if there was any considerable samples of fat hogs there seems no doubt but that it would very readily be taken up through coöperative marketing.

Lambs.—The coöperative lamb marketing work instituted in six counties of the State during the summer of 1919 was the first time work of that sort had been undertaken. The results were, on the whole, very satisfactory. Only one additional county made a shipment this summer. Most of the lamb crop goes to market after July 1st. Baltimore, Philadelphia, and Jersey City are the three markets patronized. As yet the Richmond market handles only a limited number of lambs. While all shipments go to one of the three markets mentioned, this makes a rather long haul from some of the western counties in the State, and consequently, a nearer market would be greatly appreciated by sheep men and dealers. During the past year there has been a marked increase in sentiment favoring the coöperative marketing of lambs and it seems quite probable that there will be a steady increase in the number of sheep and lambs sold that way.

Wool.—In the summer of 1920 plans were made for holding three district coöperative wool sales in the State. One was to be at Asheville, in the mountain section, another at Greensboro, in the Piedmont section, and a third at Washington, in the coastal section, thus having them so located that wool from all over the State could easily be assembled at one of the three points.

Circular letters were mailed out to approximately 4,000 sheep growers in the State calling attention to these sales, and inviting them to list their wool for sale. Sheep growers from a large per cent of the counties listed wool. The sales were to have been held in the latter part of August and the forepart of September.

Because of the demoralized condition of the wool market, arrangements were made with one of the larger woolen mills in the State that, in case a satisfactory bid was not received for the wool in the sales, they were to take the wool and make it up into blankets at a minimum charge and return the blankets to the original consignors of the wool.

Because the wool market failed to improve the sales were all called off and instructions were sent the wool growers for consigning their wool to Elkin to be manufactured into blankets. A considerable part of the wool holdings were thus converted into woolen cloth, yarns and blankets and returned to the consignors to dispose of as they saw fit.

Few of them had any surplus for sale. The cost of manufacturing a pair of double blankets 72x84 inches was \$5.00 and the average amount of unwashed wool required was approximately twelve pounds. Depending upon the quality of the wool, three grades of blankets, ranging in wholesale value from \$12.00 to \$16.25 could be manufactured. The bulk of the North Carolina wool made the medium grade blanket worth \$14.25 at wholesale.

This method of disposing of the wool was very satisfactory except, perhaps, to a few of the larger sheep growers who are preparing to hold their wool in anticipation of a better market later. A number of Missouri farmers were permitted to consign wool to the Elkin mill on the same plan.

CREDIT UNIONS

The Credit Union work has been in charge of Mr. J. M. Henly since July 1st. He has shown a fine grasp of his field and much good work is expected of him in the future.

There are at present thirty-three credit unions incorporated in the State. Sixteen of these are organized among white farmers and seventeen among colored farmers. They are organized in seventeen counties in various parts of the State from New Hanover to Madison counties, so they touch the different types of farmers in the State. Most of the colored credit unions operate in the cotton and tobacco growing sections. They do good work in getting their members out from under the influence of the time merchant. These credit unions accept the members' notes for the amount of their orders through the credit union purchasing agent, deposit the notes with the bank as collateral, and borrow enough to make the cash wholesale purchases. The liberal terms of the banker makes this possible. Following is a table showing some of the savings made for the members of the Wendell Credit Union through coöperative purchases:

	<i>Cost to Members</i>	<i>Local Retail Cash Price</i>
10 tubs lard.....	\$.25	\$.27½
1 bbl. sugar.....	.17½	.20
16 bbls. flour @.....	13.00	14.25
1 ton feed.....	55.00	60.00
25 bbls. flour @.....	12.25	14.25
10 tubs lard.....	.26½	.30
200lb sugar.....	.22	.27½
47 tons fertilizer.....	47.50	55.00
8 tons top dresser.....	74.45	90.00
20 bu. oats.....	.70	.90
5 bbls. flour.....	13.25	15.25
1 bbl. sugar.....	.27½	.32½

By starting this way with coöperative purchasing, these colored farmers are learning the lesson of coöperation and are preparing themselves for coöperative efforts in the various phases of their business.

The credit unions organized among the white farmers take less of the form of a coöperative purchasing society and more of the real coöperative bank. They encourage deposits—some are able to create enough capital to meet their needs—and make cash loans to their members. In some communities the credit union is proving of inestimable value, not only by meeting the credit needs of the farmer, but by creating a community interest and thereby aiding the farmers in getting together for coöperative enterprises. Following is a table showing the purpose of the loans and the saving made by members of the Carmel Credit Union:

LOANS MADE BY CARMEL CREDIT UNION—JANUARY 1, TO JULY 1, 1920

	<i>Cash</i>	<i>Time Price and Interest</i>	<i>Saving</i>
For fertilizer.....	\$3,000.00	\$3,600.00	\$600.00
For feed and food.....	875.00	962.00	78.50
To hold cotton.....	500.00	600.00	100.00
Milk truck.....	350.00	385.00	35.00
For cows.....	300.00	330.00	30.00
For labor	300.00	300.00	.....
Farm implements.....	200.00	220.00	20.00
Hospital and college account.....	210.00	210.00	.....
Credit Union stock.....	25.00	25.00	.....
	<u>\$5,750.00</u>	<u>\$6,632.50</u>	<u>\$872.50</u>

Time of loans.....	50 days to 12 months
Number of borrowers.....	25
Average loan	\$230.00
Saving to each borrower, average.....	\$ 34.90

Although the growth of the credit unions during the past year has not been rapid, they have been steadily gaining as shown by the following figures taken from the financial statements of September 30, 1919, and September 30, 1920:

<i>Date</i>	<i>Number Members</i>	<i>Deposits</i>	<i>Loans</i>	<i>Total Resources</i>
Sept. 30, 1919.....	1,008	\$28,093.42	\$41,740.94	\$ 53,437.07
Sept. 30, 1920.....	1,387	52,343.81	86,333.44	102,103.12

There are two factors which somewhat limit the growth of credit union work in this State. They are: (1) The lack of trained and efficient leaders and, (2) the lack of business methods and education as to the advantage of credit among the farmers in general.

Wherever a credit union has made a signal success, it has been guided by an enthusiastic community leader, and wherever a credit union is organized and does not make good progress, an investigation reveals the fact that there is no leader with the ability to push the undertaking and make it a success. The credit union undertakes to capitalize character, therefore the membership must be stable and the members know

and have confidence in each other before they can work together. Real, stable credit union growth, then, must come with this permanent, home-owning population, its education in sound business methods, and the development of community leaders with energy and ability to direct coöperative enterprises.

PERISHABLES

The work in marketing perishables is under the supervision of Mr. Gorrell Shumaker and assistant. This department has been very active during the year and has done very creditable work.

COWPEAS AND SOY BEANS

During the early months of the past winter a survey of the supply of the soy beans and cowpeas available for seed purposes disclosed a serious shortage. Growers were warned of this fact and those who had not sold hastily were rewarded with an increase in price of more than two dollars per bushel. The growers were permitted to advertise their seed in the Farmers' Market Bulletin provided they were willing to guarantee purity of variety and germination quality and the surplus soon found a ready sale. Many of those who sold early did so because of a lack of storage facilities. Coöperative warehouses would enable these growers to hold their seed in good order for the higher prices prevailing just before the spring seeding. The warehouses would also permit the use of grading and cleaning machinery, resulting in the sale of better seed as well as an increase in the price to the growers.

Federal reports indicate that the 1920 seed crop just harvested is no heavier than the 1919 crop, even though it was expected that the high prices paid for seed last year would induce growers to cut down acreage used for forage and to increase the acreage allowed to mature for the seed crop. From these facts it would seem that another survey, similar to the one made last season, should be of value to North Carolina growers. The idea would be to locate surplus seed stock yet in the hands of the growers in an effort to determine the approximate percentage sold to dealers in seeds at the harvest season.

SWEET POTATOES

The 1919 crop of sweet potatoes forced many North Carolina growers to find a market outside of the State for their surplus stock. Before this time Catawba County was practically the only section to ship to the more distant markets. It is doubtful if even the 1919 crop was really in excess of the State's need, the problem being one of distribution. The growing popularity of the storage houses in certain sections has made possible better keeping conditions, and these neighborhoods may possibly be over-supplied with market stock, but there are so many other sections where the most of the sweets rot in the bank storages. It is

believed, therefore, that no great quantities need be shipped north were facilities for local distribution given better attention.

The 1920 crop for this State is reported to be heavy and under these circumstances we may be forced to cater to the northern markets. In this case our growers have the advantage of the experiments of the more southern states for last season they shipped considerable quantities of the southern sweets into the northern markets, thus familiarizing the trade there with the most delicious qualities of this commodity, and thereby paving the way for a much greater demand this season.

A study of several cars shipped from this State to northern markets during the past season proves conclusively that it is not safe to ship bank-stored sweets any great distance. They rot very badly even in short hauls if the cars are not well ventilated. Studies of storage houses have indicated that good marketable stock will keep in excellent condition provided the principals under which the storages operate are not overloaded. Failure to comply with storage house rules caused a loss of about 30 per cent in one of the larger North Carolina storages during the past season.

In order that shipments to northern markets from this State might be uniform in quality and condition, the revised sweet potato grades as recommended by the Federal Bureau of Markets were adopted as the legal standard for North Carolina. Southern sweet potato growers have a good opportunity on northern markets provided they ship a good quality article at all times.

SWEET POTATO SPECIAL DEMONSTRATION CAR

This division coöperated with the Division of Horticulture and the Plant Pathologist in equipping a special sweet potato exhibit car. This car contained a miniature model sweet potato storage house, working plans and specifications for various sizes of this house, pictures and charts illustrating approved methods for growing, harvesting, and storing, charts and slides illustrating diseases and their control, together with a display of the standard market grades, and both faulty and approved types of packages. The car was on its tour three weeks and in that time was exhibited at 31 points in the leading sweet potato producing centers. Over two thousand people visited the car and an enormous quantity of free literature was distributed. Four railroad companies coöperated in moving this car from point to point, a total distance of over eleven hundred miles. Judging from the greatly increased number of calls for storage house plans, as well as the intense interest displayed in the exhibits, it would seem that this trip was very successful. The idea apparently appealed to South Carolinians, for a similar car was fitted out and sent to South Carolina producing centers during the recent harvesting season.

MOUNTAIN PRODUCTS

In addition to the work with sweet potatoes and apples, some attention has been given to grades and packages for bunch grapes and plans are under way to include cabbage as soon as possible. Both potato grades and apples grades, as recommended by the U. S. Department of Agriculture, have met the approval of the growers and have been adopted as the legal standard for North Carolina.

Mountain potato growers are being advised either to sell at digging time, or to build coöperative warehouses along railroad sidings. A study of past results indicates that on an average the growers selling at harvest time make the most money. The crop comes in ahead of the bulk of the northern crop and hence it has less competition. Prices may be higher during the winter, but at that time it is impossible to dig the potatoes from the bank storage. A little later the thaws come and then it is impossible to haul over the mountain roads. When the roads dry out it is warm enough to permit heavy movement from all the leading northern and western producing sections, and hence the North Carolina potato goes on the spring market in competition with the product from other sections where growing costs are materially lower. Should the growers store in commercial houses along sidings, they might take advantage of the high prices during the winter and when competition from other sources is practically impossible.

Apple growers are being urged toward improved grading and packing methods. The unusual quality and color of North Carolina apples makes them especially suitable for the fancy trade, but extreme care must be used in packing, grading and sizing this class of fruit. So many growers still spray carelessly or not at all that the apple industry is not what it might be, considering our wonderful natural advantages.

The first Western North Carolina Apple Show recently held at Asheville (October 27, 28, 29) was a revelation to those who attended. The show was successful not only as an educational exhibit, but as an advertising medium as well.

The southern market rightfully belongs to North Carolina apple growers, but in the past many of them have flooded these markets with inferior or ungraded fruit, thus seriously curtailing the demand for all North Carolina fruit. In the meantime the dealers have been purchasing more and more of western and northern fruit and it is only by putting on the market a distinctly superior pack that our growers can gain prestige in this section. Our uniform State grading system should make this possible.

FRUIT AND TRUCK MARKETING ASSOCIATION

During the past year the Division of Markets has assisted in the organization of two coöperative associations of peach growers, a truckers' association, the State Horticultural Society with its separate marketing organization, an association of apple growers, and a soil improvement

association. The latest demand for assistance comes from the cantaloupe growers of the Laurinburg section. They will grow 600 to 1000 acres in 1921.

Organization of potato, apple, and cabbage growers are needed all over the mountain counties. In this section coöperative cold storage on railroad sidings would facilitate the marketing of enormous quantities of perishable products which at present never reach a market.

STANDARDIZATION OF GRADES AND INSPECTION SERVICE

Meetings have been held at important producing sections with an idea of discussing with the growers what requirements should be included in the grading standards for various products. Already the grades as recommended by the United States Department of Agriculture have been adopted as the legal standard for North Carolina strawberries, potatoes, sweet potatoes and apples. Studies of grades for peaches and grapes are contemplated. Numerous meetings have been held to explain and demonstrate the various grading standards.

Studies have also been made of the many types of containers in use in this State and the better types have been endorsed through speech, demonstrations and the press.

Considerable improvement has been made in the grading and packing as a result of the 1919 inspection work. Because of a serious shortage of men in the division, this work has been handicapped during 1920. A member of this division served as inspector for the Chadbourn strawberry belt and local inspectors for potatoes at Mount Olive and Bethel were appointed. This work cannot be continued in full swing, however, until additional help is secured.

MARKET NEWS SERVICE

In coöperation with the Federal Bureau of Markets, this division supplied the men for operating the strawberry daily market reports from Chadbourn again this season. The season was a short one, but a very successful one for growers. It is believed that the acreage will be increased very much another year. Thirteen daily reports and a summary were mailed to a list of over 400 growers.

During September, October and November ten weekly apple market circulars were mailed to 800 North Carolina apple growers and a number of newspapers have coöperated by publishing these reports so that most every apple grower in the State has had ready access to this information.

These reports consisted of information from the Federal Bureau of Markets and clippings from the trade papers, supplemented with voluntary reports from growers in all the important North Carolina producing sections, and from dealers in all important Southern markets. Judging from the remarks of the growers and the cooperation of the

dealers, this is the most popular market news service work ever attempted by this division. This is largely because of the fact that we have attempted to cover thoroughly the particular markets in which the growers were interested. This information, unfortunately, could not be secured from Federal reports. Another interesting feature is the large number of local loading point reports.

Other lines of market news service are the Weekly Price Report and the Weekly Hog Market Quotations. The aim is to feature market news service work in all lines during the coming year. It is believed that the proper type of market news service offers us greater opportunity for assisting growers than any other one phase of the work.

EXHIBITS

Two fair exhibits were installed during the year. The first of these consisted of a three-booth exhibit at the State Fair. One booth featured cotton warehousing and the State warehouse system, another the use of the truck as the ultimate solution of the short haul, and the third booth was divided between mechanical sizing of fruit and coöperative marketing of wool through blankets. The second exhibit was at the Western North Carolina Apple Show at Asheville. Here again we featured wool marketing and rural transportation. Transportation difficulties prevented the exhibiting of the mechanical fruit sizer constructed for that show. A great amount of interest was manifested by visitors in both these exhibits. A much more elaborate exhibit and a grading and packing demonstration should be planned for the 1921 Apple Show.

PUBLICATIONS

In addition to the marketing news service work described, this division has issued market circulars and bulletins as follows:

Farmer's Market Bulletin, issued monthly.

Weekly Price Report.

Weekly Hog Market Quotations (November to June).

Monthly Review of Producers' Prices (Discontinued since April).

Monthly Financial Statement of North Carolina Credit Unions.

Circular on Harvesting, Grading and Packing Peaches.

News articles on Cotton Grading, State Warehouse System, Grade and Package Standardization and Peanut, Livestock and Potato and Wool Markets.

There are two fields of activity in marketing which are at present not receiving adequate attention from this division, the marketing of tobacco and the marketing of so-called field crops. With regard to the tobacco situation, it is becoming apparent that the next probable step will be the development of a tobacco warehouse system similar to the Cotton Warehouse System. But before we reach that stage much preliminary work will have to be done in the way of investigation, education, and organization. I, therefore, recommend that authority be given for the appointment of a specialist in tobacco marketing for these purposes.

With regard to field crops, this has been, it appears to me, a somewhat neglected field of opportunity. There has been much talk of a reduction of the tobacco and cotton acreage. From both the marketing and farm management points of view, I am quite sure that this is the proper thing to do. But a reduction of cotton and tobacco implies an increase of production along other lines, livestock, field crops, etc. In other words, when we are stimulating the production and aiding in the marketing of field crops, we are indirectly aiding in the reduction of cotton and tobacco. I, therefore, recommend that authority be given for the appointment of a specialist in the marketing of field crops, whose duty it shall be to improve methods in the marketing of field crops, to coöperate with the United States Bureau of Markets in the marketing of grain and other field crops, and to carry out the provisions of the North Carolina Act of 1919, establishing standards for agricultural products, so far as this law relates to him as a member of this division.

Respectfully submitted,

B. F. BROWN,

Chief, Division of Markets and Rural Organization State Superintendent of Warehouses.

TEN YEARS OF PROGRESSIVE CORN GROWING IN NORTH CAROLINA

Upon starting farm demonstration work in North Carolina in the fall of 1907, the State agent, upon investigation, found that North Carolina, like most of the other southern states, was buying large quantities of corn which could be grown in the State for less than one-half of what was being paid for it. Corn, therefore, was considered to be, at that time, one of the most important agricultural problems of the State. It was therefore immediately tackled with the idea of so increasing the yield that no corn would be shipped into the State. This was no little undertaking.

Eight county agents were selected and started to work in as many counties. About their first work was the calling of a number of meetings in each of the eight counties, and some others. These were called "Seed Corn Meetings." They were held in January, February and March. Farmers brought in ten, twenty or thirty ears of their seed corn for inspection and for study. The whole meeting was devoted to explaining and showing how to select seed corn and to discussion of the best methods of growing corn. The meetings, therefore, were really corn growers' meetings with the elimination of everything except something pertaining to corn growing.

The methods advocated were also disseminated through the State press, especially the *Progressive Farmer*, through bulletins, circulars and by personal contact of the county agent with farmers.

Each county agent also established from fifty to one hundred corn growing demonstrations in his county. The methods being advocated for successful corn growing were followed on these plats varying from one to five, and occasionally ten acres. In the early growing period of the corn there was no discernable difference between it and corn grown in the ordinary methods, so farmers became more or less skeptical about the value of the methods. Before maturity, however, the corn began to show the results of good methods so that farmers really became intensely interested in the matter. Many of the demonstrations showed up so well that some farmers thought they had extra fertilization in some way. Many of the demonstrations were visited by scores of neighboring farmers who went to see the corn and to learn the methods by which it was grown. These demonstration plats yielded all the way from 30 to over 100 bushels to the acre, while adjoining plats of the same type of soil were producing from ten to forty bushels. Thus, not only was the demon-

strating farmer benefited, but the matter spread from one farmer to another until practically the whole of the county was influenced.

When fall came the county agents held field meetings where they would assemble farmers in groups on the demonstration plats and teach field selection of seed and give the reasons for the selections. This was followed by discussions of proper methods of storage, keeping out weevils and other insects and the prevention of diseases. In this manner the whole phase of corn production was taught, each part of it at the proper time, but all linked together as a whole.

The yields of corn under demonstration methods more than doubled the average yield of the State otherwise, so that many farmers who had previously bought corn every year soon were selling corn. The second year the number of county agents was increased to sixteen and the third year to twenty-four. After this the increase was very substantial until it reached 85 during the war period.

On account of the small number of agents the first three years and the work of getting successful methods thoroughly understood and disseminated, we will say that it took three years to get successful corn growing on a large enough scale to really count much in the aggregate yield in the State. Allowing three years, therefore, for the work to get started, we will consider what has been accomplished in the ten year period since then.

Every year of this ten year period the yield, directly under demonstration methods, has more than doubled the yield of the State, except one year when it was just a bushel and a half per acre less than double. Gradually the yield of corn in the State has increased from about 15 bushels, the average ten years ago, to $22\frac{1}{2}$ bushels this year. This is at the rate of about 3 pecks per acre per year. This may seem an insignificant increase, yet it means $7\frac{1}{2}$ bushels increase per acre for the ten years, or to $22\frac{1}{2}$ bushels per acre where the average yield for a forty year period previously was less than 15 bushels per acre.

In round numbers there are now planted about twenty million acres of corn in the State. This increased yield therefore means a total increase of about two and one-fourth million bushels of corn per year, which at present prices is over \$4,000,000.00 per year; but this is not the whole story, nor even one-half of it.

Farmers who follow good methods of corn growing increase their soil fertility, because to grow profitable crops of corn necessitates the growing of leguminous and other cover crops and the use of good farming methods generally. Therefore, they are building up the fertility of their soils which results in larger and more profitable yields of other crops, the getting of more livestock and general progress.

The few things necessary for successful corn growing seem simple, yet they are important. They may be briefly stated as follows:

1. Either drainage or terracing according to conditions.
2. The growing and turning under of large areas of leguminous and other cover crops.
3. Deep breaking and thorough pulverization of the soil.
4. The judicious use of moderate amounts of fertilizer of a kind suited to the conditions under which it is applied.
5. Frequent, shallow cultivation with labor saving implements.
6. The use of improved seed for planting.

C. R. HUDSON, *State Farm Demonstration Agent.*

